

SOMA 2023

Proceedings of the 24th Symposium on Mediterranean Archaeology

Ideas that Travelled by the Sea
Udine, 2–4 February, 2023

Edited by
Massimo Capulli



Access Archaeology



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Back cover: San Nicoletto Shipwreck – direct measurements. Images © Massimo Capulli.

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About SOMA 2023

With the support of the University of Udine, the prestigious premises of the University's Scuola Superiore in Palazzo di Toppo Wassermann hosted the XXIV Symposium on Mediterranean Archaeology from 2 to 4 February 2023. The event was organised by the Department of Humanities and Cultural Heritage of the University of Udine, in collaboration with the General Association for Mediterranean Archaeology (GAMA) and under the patronage of the Italian Institute of Underwater Archaeology.

For decades, the Symposium on Mediterranean Archaeology has been an important occasion for the scientific community to meet and share research. Due to the coronavirus pandemic, the 24th edition—originally scheduled for autumn 2020—was postponed until it could be held safely in person. After a long period of online meetings, perhaps too long, the gathering in Udine finally allowed participants to meet face to face again. This was a moment that had been deeply missed, as we are both teachers and students: ready to present our work, to learn from the best contributions of others, and to welcome constructive criticism, transforming it into suggestions for improvement.

Entitled Ideas that travelled by the sea, the 24th Symposium featured presentations on maritime archaeology, including navigation, ports and landing places, and coastal landscapes. Particular attention was also devoted to shipbuilding and ancient Mediterranean trade routes, thanks above all to the contributions of underwater archaeological research.

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Shipwrecks and Site Investigations

Roman Period Shipwrecks off the North Shores of Ist Island

Luka Bekić¹

Abstract

A number of new underwater archaeological sites have been identified in the immediate proximity of the island of Ist in the course of the underwater archaeological survey (reconnaissance) of Zadar County, performed by the International Centre for Underwater Archaeology in Zadar. This paper details the discovery of four previously unknown Roman period shipwreck sites. These wrecks have tentatively been dated to the early Roman to late Roman periods, while comprehensive investigation of these sites remains to be undertaken.

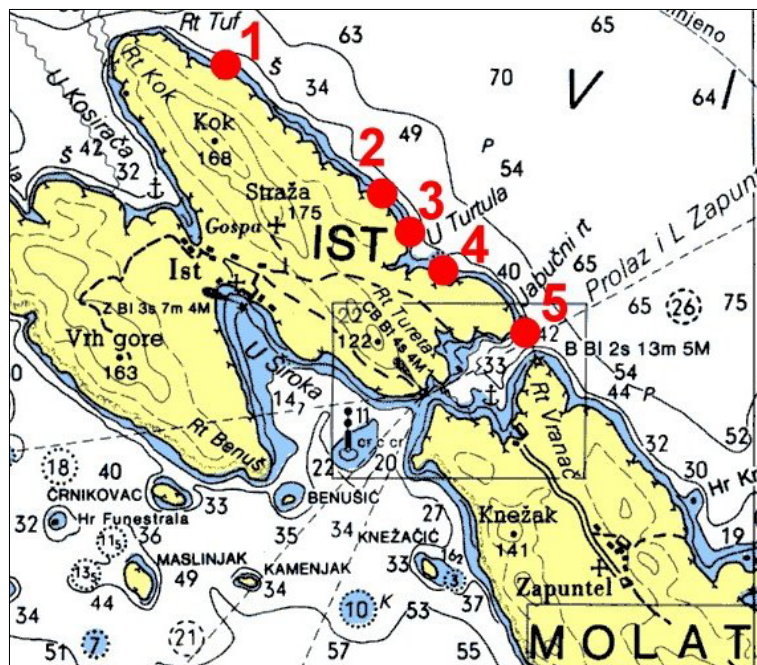


Figure 1. Map of the sites off the north coast of Ist island (Elaboration by the Author).

Discussion

Ist is one of the smaller islands in the north end of the Zadar archipelago. Its southwest side faces the open sea, and its northeast side the Velebit mountain range and Virsko more (a broad area of the Adriatic Sea roughly between the islands of Vir, Molat, and Ist). The area around Ist is dotted with a number of islets and rocks. Even in the present day the strong winds and waves often preclude navigation of these waters, with strong marine currents often flowing in the channels between the

¹ International Centre for Underwater Archaeology in Zadar (ICUA), Croatia.

islands. Navigation in the Ist area was, thus, often fraught with peril, especially for mariners in the ancient past. The International Centre for Underwater Archaeology in Zadar has for a succession of years performed field investigations in the waters off Ist. These efforts were initiated in September of 2014, when a team of ICUA underwater archaeologists (Bekić, Pešić, Surić, Šimičić) explored the future route of an electric power cable to be laid between Ist and Škarda island. This occasion saw the find of a previously unknown late antique wreck off the Škardski cape with a cargo primarily comprised of LRA1 amphorae.

The following year, in April of 2015, dives were performed off the south of Tramerka island and around the nearby Bačvica rocks (Bekić, Pešić, Surić, Šimičić). May of 2017 saw the survey of positions in the Zapuntel channel, off the Jabucini cape, and Mljake in the frame of the inter-ministerial co-ordination at sea programme. Dives were also performed off the north of the island, near the Tuf cape (Bekić, Surić). October of that year also saw dives in the frame of the inter-ministerial co-ordination around the Maslinjak islet. Following on reports from divers, December of 2019 saw dives performed off the south shores of Ist island, facing Škarda island, and on the south side of Kamenjak islet near Ist (Bekić, Kaleb), not yielding, however, any significant archaeological finds.

October of 2020 saw a multi-day survey of locations of interest off Ist island. The area around the submerged stone masonry moles at Mljake cove were examined, identifying a number of post-medieval ballast heaps, and the systematic survey of the whole of the north shore was initiated. Another Roman period wreck was found in the Bočac cove. The area around the Križica rock to the north of Ist was surveyed, as was the Kosirača cove. June of 2021 saw a new and comprehensive archaeological survey that included exploration of positions around Kamenjak and Knežčić islets in Mljake cove. The remains of an amphorae site off the Kamenjak islet was finally located. There was also a repeated exploration of the possible site of a wreck off the Jabucini cape. This yielded the find of numerous amphorae sherds.

The survey of the north shore of Ist, and - when the norther-easterly *bura* wind prevented access to the north side - of a number of other positions such as the Mavrela and Pud Maciji coves, continued in May of 2022. Three sites of the remains of Roman period ships were identified this year: one at the Turtula cove, another off Prisika, and the third at the Mali Tuf position. The remains of a German boat sunk in World War II were found near Kozji vrh. With this the north shore has been surveyed almost in its entirety; the seabed off the island does, however, cover a very extensive area, and it will take years to fully explore it.

Our interest here is only in the wrecks located to the north side of the island. They are confirmation of the fact that navigation of the waters between the islands of Ist and Pag, an area known as Virsko more ('Sea of Vir'), was perilous indeed. Facing Ist is the low profile of Pag island, and immediately behind it rise the heights of the Velebit range, from which the strong and sudden north-easterly *bura* wind rushes down. The sea here is broader than in the narrow channels between the islands of central Dalmatia, and there are no obstacles to the gusty north-easterly as it pushes the waves that drive unwary mariners to the north shores of Ist island. Given these conditions it is to be expected that numerous ships were smashed against the cliffs of Ist, and the field survey thus followed the shoreline.

Mali Tuf

As viewed from the northwest side of the island, the first possible wreck site is an accumulation of amphorae to the south of the Mali Tuf position. It stretches across an area with depths of from four to ten metres. The amphorae are highly fragmented, but all point to a single basic form (Plate 1). This is the well-known Lamboglia II type, which was produced along the northern Adriatic coast. Based on the collar type rim we see on one of the sherds (Plate 1: 1) we can conclude that these are later variants of the Lamboglia II type, which date to the whole of the 1st c. BC through to the early 1st c. AD (Starac 1995: 126–8).

This is the most frequently found amphora type in the Adriatic, dating to the period of very intensive commerce between the two opposite Adriatic coasts and of the Roman colonisation of Illyricum. There are dozens, likely over a hundred, wrecks with cargoes of this amphora type along the east coast of the Adriatic. The quantity of sherds at the Mali Tuf position is not particularly large, and likely come from a small ship, or a ship that carried some other cargo.

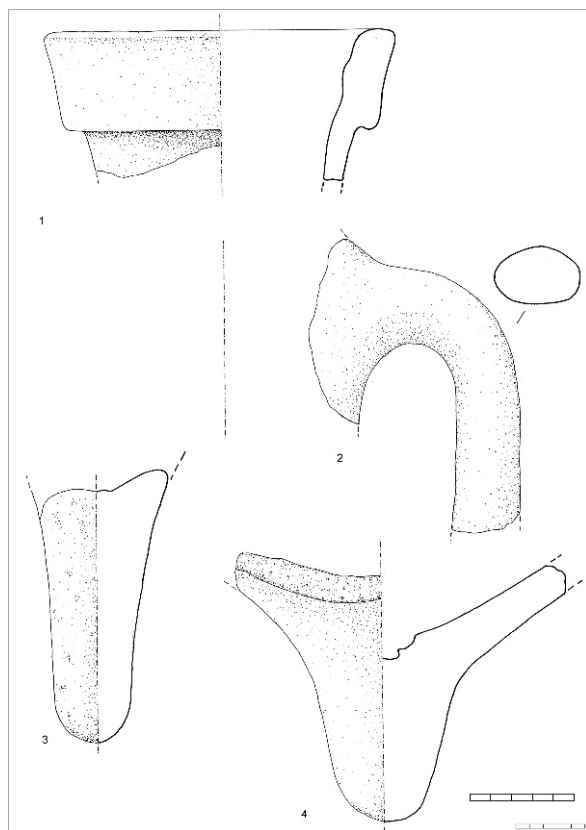


Plate 1. Mali Tuf 1.

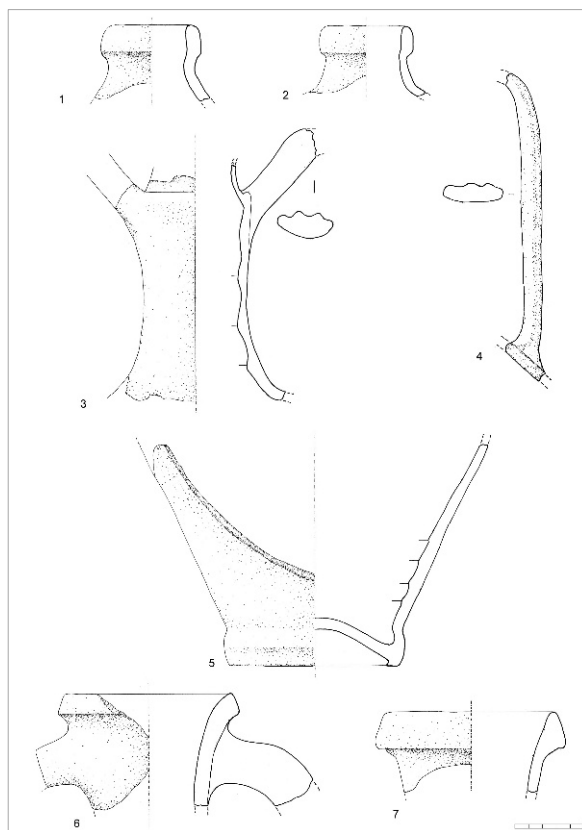


Plate 2. Prisika 1.

Prisika

To the south of Prisika cove are abundant traces of a Roman period wreck with a large cargo of amphorae. The sherds are strewn across a broad area; the seabed here is very rocky, with the artefacts

lodged between the tall rocks and crevices. Three conglomerates of potsherds have been identified, each covering some two to four square metres. Conglomerates of ceramic material is a phenomenon seen at many Roman period wreck sites below depths of ten metres. These are densely packed amphorae sherds that have been at rest for long enough to have become fused by calcareous deposits to form a solid and unbreakable structure. The many other amphorae sherds are scattered about the underwater crevices across a broad area. A large number of square pieces of grey-green sandstone was also observed, which may have served as raw material for whetstones (Plate 3: 8). We cannot rule out the possibility that the greenish sandstone was used as the ship's ballast. Also among the artefacts were multiple sherds of cooking ware, tableware, and glass (Plate 3).



Figure 2. A diver alongside a conglomerate of amphorae sherds at the Prisika site (Photo by the Author).

A globular pot of restricted form with ledge handles (Plate 3: 6) has an upright rim with a rounded lip. This sets it apart from the frequent similar pots of Aegean origin found in our region. This was likely an Italic product of the late 1st or first half of the 2nd c. (Ostia III: 298, Fig. 710). The top part of a glass bottle or jug was found. This is the ledge rim and neck of a bottle with traces of the handle joined to the neck just below the rim (Plate 3: 1). The other two fragments are from the bases of two square bottles (Plate 3: 2, 3), one of which has a base decorated in relief. All of these fragments are consistent with the Isings forms 50 or 51; these bottles appeared in the mid-1st c. BC and date through to the 3rd c. AD

(Isings 1957: 63–9). There is a visible maker's mark on the base of one of these bottles, impressed in relief by a mould (Plate 3: 3). This fascinating mark is comprised of a number of elements; small circles with a central dot arranged at the corners of the base, two larger circles at the middle, and a vegetal motif with elongated leaves or petals at the very centre. I have not come across this mark in the available literature; however, its elements are present on bottles recovered at multiple places in Croatia.

Thus, we often find circles at the corners of bottles from Iader and Scardona, dated largely to the late 1st and early 2nd c. (Fadić and Štefanac 2012: 14, Pls. XIV–XVII). The centrally placed circles appear less often (Fadić and Štefanac 2012: Cat. No. 171), while the leaves at the centre are more frequent (Fadić and Štefanac 2012: Pls. XXVIII, XXIX), and there is a particularly similar depiction of petals from two surviving bases (Fadić and Štefanac 2012: Cat. No. 185–6). Most of these specimens from Zadar, Bakar, and Skradin also date to the late 1st and early 2nd c. Outside of Croatia we find similar, but not identical, mark elements on Isings 50 type bottles. These include a bottle found at the Pomègues port in France, of pre-2nd c. date (Foy 2013: 54, Fig. 1, No. 2), and a bottle from the Segóbriga amphitheatre in Spain (Sánchez de Prado 2006: Pl. 1, E-CAR-079). These are currently our best analogues for the mark on the base of the bottle recovered at the Prisika site.

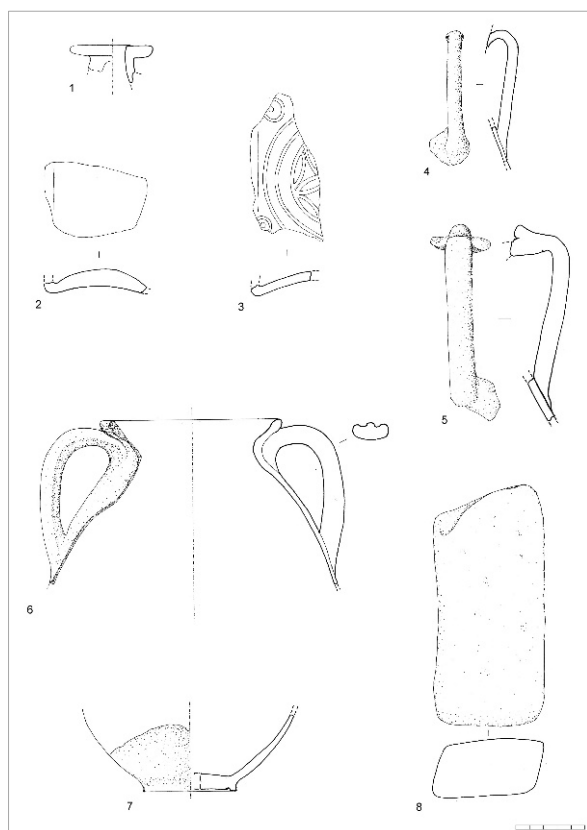


Plate 3. Prisika 2.

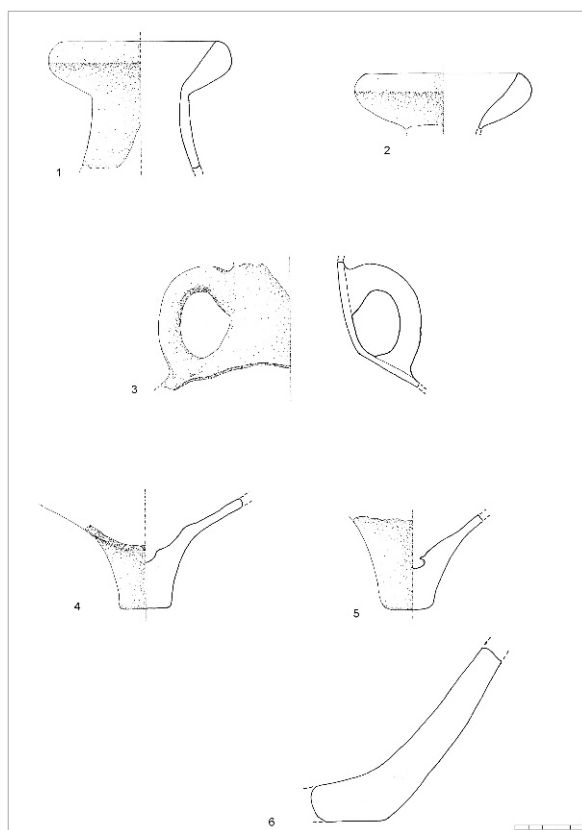


Plate 4. Turtula 1.

The recovered amphorae sherds (Plate 2: 1–5) point to the Santarcangelo type (Bertoldi 2012: 113) of mid-1st to mid-3rd c. date. That this is the form in question is evident from the collar rim, the thin and

flat handles, the high-set central part of the base, and the small sloped foot. Also observed along with these artefacts were two rim sherds from an early variant of the Lamboglia II amphora (Plate 2: 6, 7) dated centuries before the Santarcangelo type, more precisely to the 2nd c. BC. These amphorae are likely not from the wreck and these two sherds came here by chance. Although Adriatic flat-bottomed amphorae are a frequent find in our waters, wrecks with cargoes of this kind are not frequent in the Adriatic. The best-known example is the wreck off Ilovik island (Orlić 1986). The cargo of this wrecked ship included Forlimpopoli type amphorae and a smaller number of Dressel 2-4 and of some other amphorae forms. Among the remainder of the identified artefacts were glass bottles of square section (Orlić 1986: 32-4).

Another similar wreck was found off the Sestrice islands near Rovinj. The cargo of this ship consisted primarily of Santarcangelo type amphorae, and numerous amphorae of the related Forlimpopoli type, along with a small number of sherds of the Dressel 2-4 form, possibly also of some other types. The remains of a number of square glass bottles were also found at this site (Bekić 2020b). There are certainly more wrecks of ships that carried similar cargoes along the eastern Adriatic coast, but they are either not published or have never been investigated.

Turtula

To the north of the Turtula cove is a broad area across which numerous small sherds of broken amphorae are strewn. Given that the seabed here is rocky, for the most part flat, and transitions to seagrass meadows, all of the sherds are highly worn. This appears to be an area covering some 50 by 50 metres, possibly more. A large central conglomerate, covering about eight square metres has been identified. It includes sherds of amphorae of the same type as seen across the whole of this area. Only a single amphora type has been identified (Plate 4). This is an amphora of north African origin, known as the *Africana* 1A Piccolo or, more precisely, the Keay IIIA form (Keay 1984: Figs. 37.4, 41.2, 7). They date for the most part to the second half of the 3rd c., with some specimens dated a half century earlier or later (Keay 1984: 108-9). They originate from what is now Tunis and are considered to have been used to transport olive oil.

Found along with these amphorae sherds was part of a large bowl-shaped vessel. It is highly worn and, consequently, not given to any confident determination of its dimensions or exact form. The clay body has an admixture of crushed pebbles, mostly black. This is likely a mortar or some form of large bowl. This was evidently, judging from the number of sherds, rims in particular, the wreck of a large ship, carrying a cargo of many amphorae, a few hundred at least.

The best-known wreck with this amphora type found in the Adriatic is off the Italian town of Grado (Auriemma 2000). That ship carried over 600 amphorae, of which over 200 were of the *Africana* 1a type. It is estimated to have carried a total cargo of 23 to 25 tonnes (Auriemma 2000: 27). A wreck with a cargo of similar amphorae, a somewhat later 4th c. variant, the Keay IIIB form, was found off the Uljeva cave near Ližnjan (Bekić 2020a: 66).

Bočac

North of Bočac cove we see sherds of amphorae of the Forlimpopoli or Santarcangelo forms, and numerous square bricks of regular and irregular section. The bricks are at their most dense within the cove, and there appears to be some order to their arrangement on the seabed, which would indicate that the central part of the ship and its cargo wound up here. This ship clearly transported a cargo solely of bricks, as the finds of amphorae and other ware is very sparse across the whole of the site.

Most of the bricks are of the *pedales* type, where the ideal length of the sides is 30 centimetres, i.e. one Roman foot, from which it gets its name. The bricks at the Bočac site have sides measuring roughly 28 by 28.5 centimetres and, quite notably, they are of irregular section, that is to say, of varying thickness at opposite ends. One end is three and the other five centimetres thick. These are solid voussoir bricks used to build arches and lintels, made in various forms (Pavloň 2015: 36). Wedge shaped bricks (*cuneatus*) have been found in the course of archaeological investigation in Morocco, where they were used in *thermae* and in furnaces (Bernardoni and Camporeale 2008: Fig. 12). The specimens from Morocco are of elongated form, measuring 23.9 by 16.4 centimetres, with the thickness ranging from 3.9 to 4.9 centimetres at the other end (Bernardoni and Camporeale 2008: 192, Type 6.11, Pl. 2.11). Bricks of this kind date to the period from the second half of the 1st to the mid-2nd c.



Figure 3. A diver with square bricks at the Bočac site (Photo by R. Surić).

Along with the *pedales* bricks there are also those of greater size and more elongated form; a collected specimen measures 32 by 43 by 5 centimetres. These are bricks of the *lydion* type, having ideal dimensions of 30 by 45 centimetres, as Vitruvius notes that they should be one foot by one and a half feet in size (Vitruvius 3. 3). These are ideal bricks for building as they overlap well when laying courses (Vitruvius 3. 3; Pavloň 2015: 32-3).

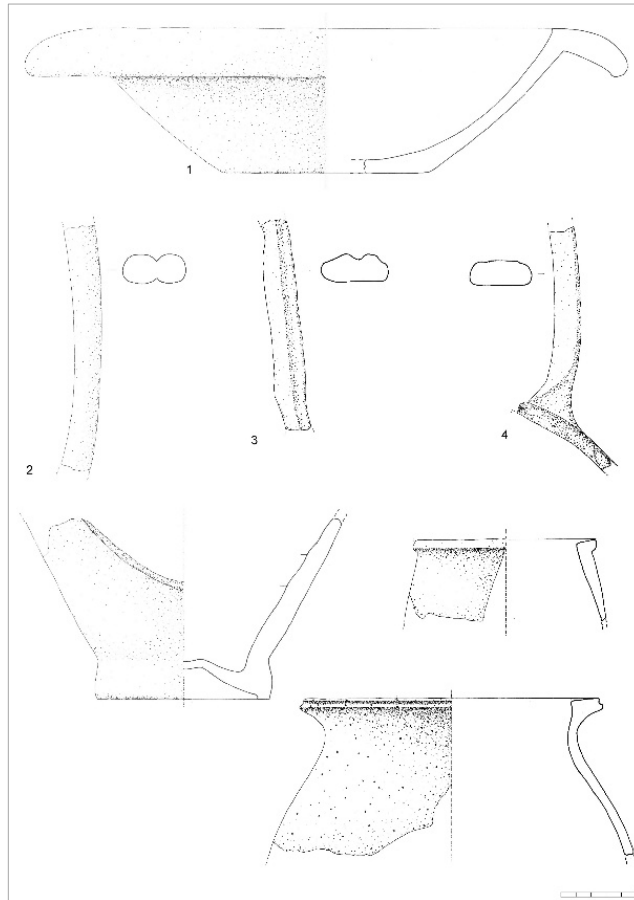


Plate 5. Bočac 1.

With regard to the amphorae, there were evidently a number of Adriatic flat-bottomed amphorae on this ship, for the most part attributable to the Forlimpopoli or Santarcangelo forms. No parts of the rims, which best reveal the differences in these forms, have yet been recovered. Based, however, on the collected handle and base sherds (Plate 5: 3, 4, 5) it is more likely that they are of the Santarcangelo type, of mid-1st to mid-3rd c. date (Bertoldi 2012: 113), produced along the northwestern shores of the Adriatic in the Piceno, Emilia, and Rimini regions. One bifid amphora handle indicates the presence of the Dressel 2-4 type (Plate 5: 2). These were manufactured at multiple Mediterranean locations from the 1st to the 3rd c. Given the other finds, this handle is from one of the Adriatic types (Bertoldi 2012: 111) from the northwest coast, although this cannot be a confident conclusion. A large fragment from a mortar (Plate 5: 1) was also found; its highly flared rim is similar to 1st c. specimens (Ostia I: Fig. 417). The Bočac cove wreck is of one of the ships that carried Roman building material. An abundant quantity of bricks is strewn across the seabed, appearing in groups one next to the other on the sandy seabed,

indicating that this is where the bulk of the cargo wound up. There are a number of wrecks that carried this kind of cargo that have been found in Croatia to date, but always of only elements of roofing material; *tegulae* and *imbrices*. These wrecks have been recorded along the whole of our coast; among them the best known are the Vrsar-Sveti Juraj (Matika 2021: 20-1), Ližnjan-Uljeva D (Bekić 2020a), Susak-rt Margarina (Vrsalović 2011: 213; Ettinger Starčić 2021), Lošinj-Pločice (Vrsalović 2011: 78, 213), Molat-Brgulje/Molat-Paržine (BNM News 2019: 8), Vrgada-Kranje (Kaleb and Pešić 2016: 39-40), and Mali Molunat-Supetrić sites (Vrsalović 2011: 213). The wreck at the Bočac cove site on Ist island is, thus, unique in Croatia.

Jabucini

Near the Jabucini cape, in the channel between the Ist and Molat islands, is an area where numerous amphora's remains are to be found. According to oral reports intact amphorae could be found here a number of years ago. The local inhabitants would often catch them in their fishing nets, and they were also alleged to have been collected by the Archaeological Museum in Zadar. A survey of the seabed identified a number of small concentrations of amphorae sherds, but without any apparent order. The amphorae are of various types, dating to various periods. As this location is not suitable for anchorage it is likely that these are the remains of multiple wrecks. No micro-locations have, unfortunately, been identified to date at this location that would point to a division among cargoes of individual wrecks. Given the depth here, this will be a challenging undertaking.

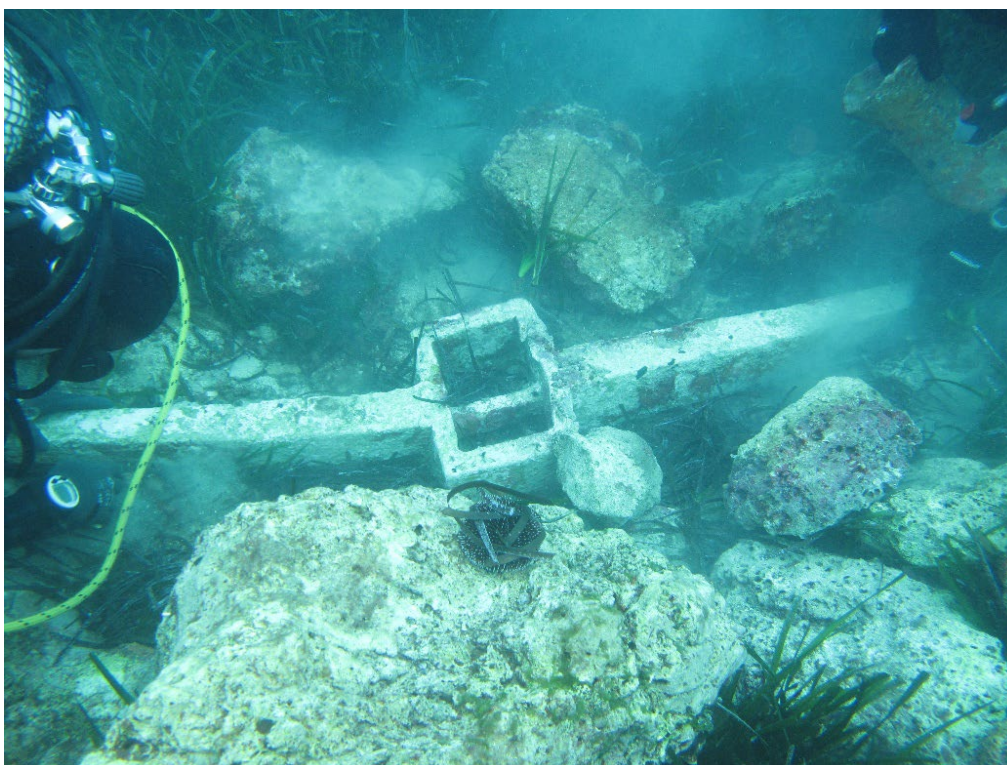


Figure 4. A lead anchor found off the Jabucini cape (Photo by Đ. Iglič).

Six amphora samples have been collected. The first amphora has wide-set and slender handles and a narrow neck (Plate 6: 1). An amphora with a funnel rim (Plate 6: 2) is of the Porto Recanati type (Bertoldi 2012: 115). The knobbed rather than spiked base of an amphora (Plate 6: 3) is also a typological feature of the Porto Recanati type. This type was manufactured along the northeast coast of Roman Italia from the late 1st to the mid-3rd c. An amphora with a bifid handle and a beaded rim with D-shaped profile (Plate 6: 4) is initially similar in appearance to the Dressel 2-4 type. The peaked handles, however, may rise above the rim at which point they turn down sharply, which is not characteristic of Adriatic Dressel 2-4 amphorae.

They are much more similar to amphorae of the Knossos A/53 type (Bertoldi 2012: 132), produced from the mid-1st to the second half of the 2nd c. An amphora with a triangular rim profile (Plate 6: 5) is similar to Hellenistic types. At the lower part of the neck there is an impressed mark (Plate 6: 6), quite worn, of which the fourth and final letter could be an A or a V. This appears to be one of the variants of the Greco-Italic amphora. It is most similar to the D type, which dates to the early 2nd c. BC (Lyding Will 1982: 356). This is the most frequent of all the Greco-Italic types, which set the stage for the future Roman production that drew on Hellenistic traditions. An amphora with a tall neck (Plate 6: 7) is similar to the Forlimpopoli type but differs from its by its tall and narrow neck and by the distance from the rim to the handle. One such specimen is, however, known to us from the Palazzo Diotallevi in Rimini (Maioli and Stoppioni 1989: Fig. 1.7) where production was dated to the late 1st to early 3rd c.



Plate 6. Jabucini 1.

Conclusion

These four confidently attributable wrecks, and very likely many more, came about as the result of the violent gusts of the north-easterly *bura*, which threw the sailing ships of the antique period against the sheer rocky shore of Ist island. The ship wrecked at the Mali Tuf site likely transported only several dozen amphorae, while the ships that sank at the Prisika and Turtula sites each transported hundreds of amphorae. The ship that foundered at Bočac carried a cargo of building material, of a still undetermined tonnage. Aside from the basic origin of the cargo and its date, more data concerning these wrecks will certainly require the performance of systematic investigation of each of the sites.

As for the remains off the Jabucini cape, we will need to continue the survey of a broad area of the seabed at significant depths in order to arrive at any concrete conclusions on possible wreck sites at the entrance to the Zapuntel channel. The International Centre for Underwater Archaeology plans to continue its investigative efforts around Ist island over the coming years.

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The San Nicoletto Shipwreck (Venice Lido Island). Results of Excavation Work and Documentation

Massimo Capulli¹

Abstract

Archaeological campaigns along the seafront of the Venice Island of Lido, conducted by the University of Udine in collaboration with the Superintendence of Archaeology, Fine Arts and Landscape of the Municipality of Venice and Lagoon and with the support of the Institute of Nautical Archaeology (USA), have focused on the beach of San Nicoletto and have involved the remains of a historical shipwreck.

The San Nicoletto wreck lies in waters between 4 and 6 metres deep. In this location, fluctuations in sea-level are a recurrent phenomenon, with storm surges and waves either excavating or covering the site.

However, in two different excavation campaigns in 2022 and 2023, the team was able to uncover and document the entire hull. In addition to direct measurements of the construction details, numerous images were acquired for subsequent 3D photogrammetric processing. The wreck is what remains of a late 19th-century cargo sailing ship, as evidenced by the artefacts and Venetian-made glass and ceramic items that have been recovered; however, the main cargo consisted of stone blocks.

Introduction

The discovery of the San Nicoletto shipwreck in late spring 2021 was facilitated by a report from the Venice Naval Station of the Guardia di Finanza², which identified a sonar anomaly situated just over one kilometre from the coast during an instrumental survey. The Superintendence of Archaeology, Fine Arts and Landscape for the Municipality of Venice and the Lagoon, in collaboration with the University of Udine, organised a verification dive in July 2021 (Asta and Capulli 2024: 121-30). The inspection confirmed the presence of a wooden hull not recorded in the ministerial archives, with recognizable structural elements (keel, frames, mast step) and large stone blocks. The absence of ancient construction techniques (Gianfrotta and Pomey 1981: 238-41), such as mortise and tenon joints or

¹ University of Udine, Italy.

² The Guardia di Finanza is Italy's military police force responsible for financial crime, tax enforcement, customs control, and economic security. It operates nationwide under the Ministry of Economy and Finance, and plays a major role in fighting tax evasion, smuggling, money laundering, and organised crime.

planking seams, permitted the exclusion of a classical chronology and the placement of the wreck in the post-classical era³, although the precise dating remained uncertain.

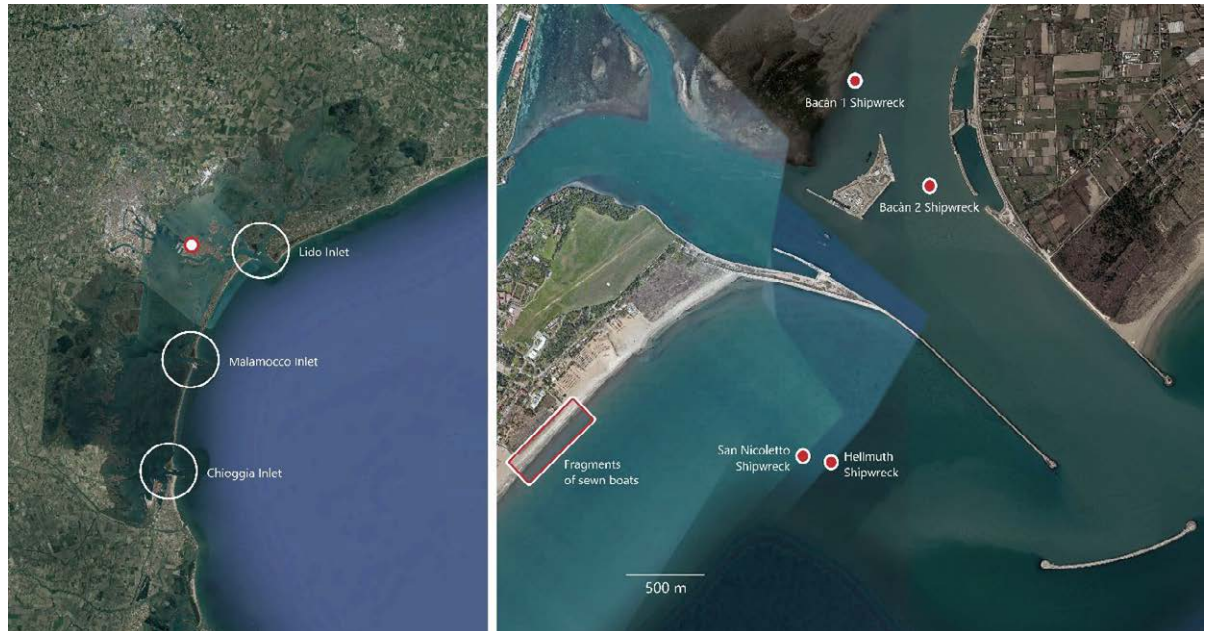


Figure 1. Left: the Venice lagoon with the lagoon inlets highlighted. Right: detail of the Lido inlet with the location of the San Nicoletto wreck and other known sites (Elaboration by the Author, background @GoogleEarth).

The wreck is located on a sandy seabed of medium grain size, at a depth of between 4.5 and 6 metres, approximately 1250 metres from the coastline of the seaward side of the Lido barrier island (Fontolan 2004: 405-8), near the Lido inlet (Figure 1). This is one of the three main access points connecting the Venice lagoon to the Adriatic Sea⁴ and its configuration as it stands today is the result of interventions undertaken in the 19th century. In 1872, the Civil Engineering Department decided to channel the waters of the Sile and Piave estuaries into a single canal (Fontolan *et al.* 2007: 261-77), bound by two breakwaters. The works, initiated in 1892 and concluded in 1907 (Muraca 1982: 1078-92), were succeeded by mechanical dredging, which reduced the depth to -10 metres (Morachiello 1991: 77-110). This was further expanded in the 1930s to enable the passage of oil tankers bound for Porto Marghera and large ocean liners. In recent years, a system of mobile floodgates has been constructed at the Venice lagoon,

³ It is widely acknowledged that the shipbuilding method employed since the early Middle Ages was founded on the principle of 'skeleton first', whereby the planking was added subsequently and without any interconnection between the planks, which were affixed exclusively to the frames (Capulli 2021a: 357-65).

⁴ Lagoons are defined as coastal basins of shallow salt water, bordered by coastal sandbars interrupted by natural passages, known as 'inlets', which connect them to the sea (Capulli 2021b: 63-7). In the case of Venice, the largest lagoon in Italy, which measures 550 square kilometres (Scarton 2017: 35-45), the exchange of water occurs through three inlets, named Lido, Malamocco and Chioggia, in a north-south direction (Facca *et al.* 2014: 1-15).

in a similar manner to the systems already in place at the other two inlets, Malamocco and Chioggia. The purpose of this system - named MOSE⁵ - is to block the entrance of the sea during exceptional high tides and to prevent the flooding of the city of Venice (Scotti 1993a; 1993b).

The Lido inlet has been the site of numerous archaeological discoveries: the site contains Roman anchors⁶, two medieval wrecks named Bacàn 1 and Bacàn 2, both with stone cargo (Medas 2014: 77-84), wooden fragments of Roman sewn boats washed up near the former Ospedale al Mare hospital (Willis and Capulli 2018: 343-56), and a 19th-century rudder blade measuring approximately 8 metres in height (Fozzati 2002: 26-7). Of particular importance was the wreck of the Hellmuth, a nineteenth-century brigantine carrying a cargo of carbon coke (Beltrame *et al.* 2020: 13-26), which was discovered in 2001 at a depth of 160 metres from the San Nicoletto site. Initially, it was hypothesized that the anomaly reported could correspond to the Hellmuth, but verification dives ruled out this possibility.

Underwater Investigations⁷

The First Excavation Campaign (2022)

The Superintendency and the University of Udine initiated a preliminary investigation campaign⁸, scheduled to take place from 20 June to the beginning of July 2022, in accordance with the data collected during the 2021 survey. The ten-day campaign⁹ was initiated with the deployment of a buoy at the coordinates provided by the Guardia di Finanza. Subsequent to this, a surface survey was conducted, the complexity of which was exacerbated by suboptimal visibility levels, ranging from 7 metres to a mere 50 centimetres. This required the use of the radial survey technique (Rosso 1987: 96-7), which entailed the use of a measuring tape to delineate a series of closely spaced circular passages, with the objective of identifying any elements that were visible above the surface. This led to the discovery of concretionary stone blocks, including the one previously observed in 2021, which was used as a reference point to orient the first excavation trench.

⁵ Acronym for Modulo Sperimentale Elettromeccanico, i.e. Experimental Electromechanical Module.

⁶ These can be traced back to a broad archaeological horizon ranging from Roman-era lead stocks to the numerous proto-Admiralty and Admiralty anchors from the sub-contemporary era (Steffy 1994: 282-3).

⁷ Both investigations were coordinated by Alessandro Asta, head of underwater archaeology at the Superintendence of Archaeology, Fine Arts and Landscape for the Municipality of Venice and the Lagoon.

⁸ The intervention was conducted by the Underwater Archaeology Squad (UAS) of the University of Udine, with logistical support from the IDRA company of Venice and the collaboration of the Carabinieri - Underwater Unit of Genoa, the Cultural Heritage Protection Unit of Venice and the Venice Watercraft Unit.

⁹ The research was supported by funding from the Institute of Nautical Archaeology (USA) and funds from the University of Udine.



Figure 2. Excavation using a water dredge (Photo by the Author).

The underwater archaeological excavation was conducted using a steel water dredger (Figure 2), powered by a jetting pump (Riccardi 1988: 37-44). In order to avoid any potential damage to the wood, the dredge head was maintained at the perimeter of the excavation area. It was connected to a 4-metre-long transparent corrugated pipe, with a diameter of 12 centimetres, which contained a copper wire core, and a 2-metre rigid PVC extension. This enabled the loosened sediment to be collected at a distance, thereby preventing it from falling back into the trench and allowing it to be reused for the final covering. The excavation proceeded along inclined planes, with the sand being removed at the correct angle of friction to prevent the material from sliding down the walls.

The primary trench was excavated along the keelson, i.e. the longitudinal axis of the vessel, thus enabling substantial segments of the hull to be exposed. The documentation process entailed direct measurements and photogrammetric surveying (Henderson *et al.* 2013: 243-56), utilizing the Computer Vision technique, i.e. Structure from Motion, with Agisoft Metashape software. In order to correct for distortion (Yamafune *et al.* 2016: 703-25), markers were placed in different parts of the hull. These markers were then trilaterated and measured for relative elevations. The data was then processed with Site Recorder 4 to obtain local coordinates (Holt 2003: 246-51). The reconstruction of a reliable three-dimensional model necessitated the utilization of a total of 1179 photographs. Concurrently, wood fragments were collected from various elements for xylotomical analysis, and the site was georeferenced using GNSS, which provided an estimated error of 1.80 metres: sufficient for protection and operational return, although not for precise topography.

The findings of the 2022 campaign proved to be of considerable significance (Capulli 2023: 1-15.). The vessel's hull remained intact, with a connection span measuring at least 19 metres from the

northwestern extremity, which can be interpreted as the bow, to the boundaries of the trench. The port side appeared to be lost, while the starboard side was well preserved. The maximum width observed was approximately 3.5 metres, but it was hypothesized that the width continued beyond the stone blocks of the cargo. The presence of the blocks had protected the wood, but prevented a clear reading of the joints between the floor timbers and futtocks. Two mast steps were also observed, one 5.90 metres from the bow and the other 16.20 metres away. Both steps had cheeks and support blocks, albeit with differences in preservation.

The Second Excavation Campaign (2023)

The objective of this campaign was twofold¹⁰: firstly, to integrate the data acquired, and secondly, to verify the extent of the hull (Figure 3). Operations¹¹ commenced with the installation of a buoy and a surface survey, the latter of which was hindered by suboptimal visibility conditions. The method of measurement employed was the radial survey, utilizing a measuring tape, and this method was employed once more in order to identify the uppermost stone blocks. Subsequent to the identification of the position in relation to the 2022 photogrammetric survey, excavation commenced with the using a water dredger at the eastern mast step. It was possible to ascertain the distance between this point and the master frame. This enabled the marking out of the originally wider part of the ship with a picket. From this point, a trench could be traced transversely to the longitudinal axis. The transverse trench did not reveal any hull parts beyond the stone elements of the cargo, even in a deeper check pit; however, excavation along the keel axis made it possible to identify the eastern edge of the hull, which was still structurally connected. At a point approximately 2.6 metres from the extremity of the 2022 trench, the keel was interrupted, and following a further 2.5 metres, a pair of planks from the starboard side, presumably adhered to the stern, were also interrupted.

The documentation again relied on photogrammetry and Structure from Motion, thereby establishing a correlation between the recent survey and the markers that had been positioned in 2022. Direct measurements and cross-checks were also carried out during this campaign to ensure the reliability of the data.

The results of the study expanded the existing knowledge of the wreck, with the skeleton being connected for a total length of 24 metres, from the bow to the eastern limits. The port side was completely lost, while the starboard side retained structural elements of great interest. An observation was made of the keel, the keelson, the frames and the mast steps.

¹⁰ The implementation of a second campaign in September 2023 was made possible thanks to the financial support of the Italian Ministry of Culture.

¹¹ The operation, which spanned five days, was once again conducted by the IDRA company.

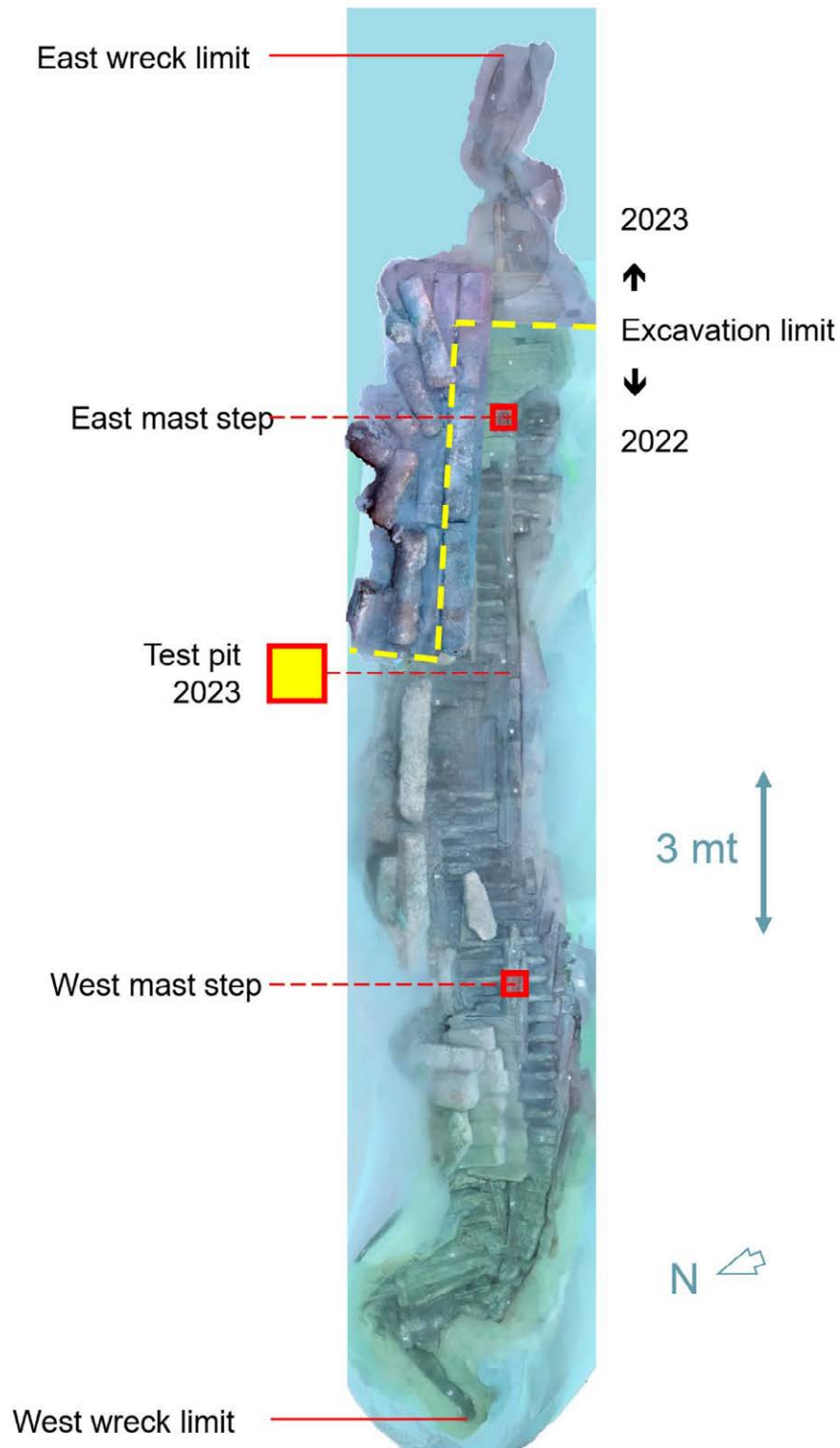


Figure 3. Orthophoto of the wreck obtained from modelling with Metashape software, highlighting the conspicuous points and limits of the activities conducted in the 2022 and 2023 campaigns (Elaboration by the Author).

The Hull

The skeletal structure of the San Nicoletto wreckage remains firmly intact, exhibiting a total length of approximately 24 metres from the bow to the easternmost extremity ascertained during the 2023 investigative endeavour. The port side, with the exception of a small part in the forward quadrant, is completely lost¹², while the starboard side is in excellent condition, allowing numerous construction details to be observed and documented.

The keel is composed of multiple beams, each characterised by an inverted trapezoidal section, with a width ranging from 17 to 21 centimetres and a height of approximately 13 centimetres. The upper edges of these beams are meticulously shaped to form a longitudinal rabbet, a design intended to facilitate the integration of the garboard, which signifies the initial course of planking.

Concurrent with the keel is the keelson, which is composed of multiple beams measuring approximately 15 centimetres in width and 13 centimetres in height. These beams are united through the using a hook scarf. Cuts measuring approximately 3cm in depth are present on the underside of the keelson, with the purpose of securing it to the frames below. A discrepancy of 6.40 metres has been identified: the keelson ends at approximately 6.90 metres from the bow and recommences at 13.30 metres, persisting for a distance of over 4.30 metres to the termination of the excavation trench.



Figure 4. The master frame (Photo by the Author).

¹² As is well known, wood exposed directly to seawater is attacked by xylophagous mollusks until it is completely devoured (Eriksen *et al.* 2015: 9-15). Therefore, what is preserved of the wooden part of a ship is only the portion that is buried in the seabed.

The frames are composed of floor timbers and futtocks, with the former measuring 12cm in width and the latter 9cm. The frames vary in height, depending on the deadrise as they approach the ends. The master frame, located 11.30 metres from the bow, is the only one to have two futtocks per side joined to the floor-timber (Figure 4), marking the point of reversal of their position with respect to the floor timbers. In summary, all other futtocks intersect with these on the face towards the near-eastern end, whether in the bow or stern.

At the lateral overlap between the elements forming the frame, a stringer is present. This is an internal reinforcement, known in Venetian shipbuilding as a 'parascossola' and, in this case, consisting of planks 21cm wide and 9cm thick, fixed with 1.5-2cm diameter treenails to the frames.

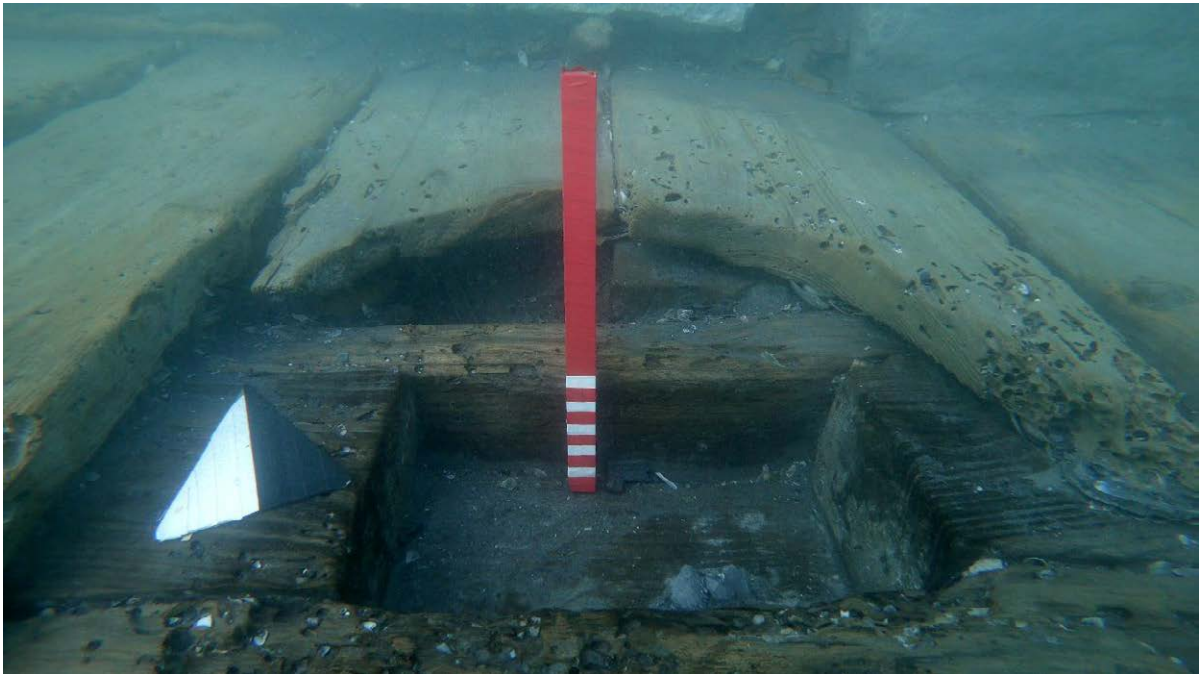


Figure 5. The east mast step, i.e. the second one (Photo by the Author).

As anticipated, two mast steps have been identified. The first, measuring 5.90 metres from the bow, consists of two planks 2.20 metres in length and 10 centimetres in thickness, both placed on their edge. These planks flank the keelson and are fixed to the frames by means of notches. Internally, one of the stop blocks, measuring 13cm in width and 11cm in height, has been preserved, suggesting an original length of approximately 30cm. The second mast step (Figure 5), located 16.20 metres from the bow, exhibits cheeks of indeterminate length due to the planking, which is 11 centimetres thick and also notched into the frames. In this instance, both stop blocks have been preserved, resulting in the formation of a box measuring 32cm in length, 18cm in width, and 11cm in depth.

Planking, measuring an average of 28 centimetres in width and 4.5 centimetres in thickness, is affixed to the ship's frame. A substantial portion of the original floorboards remains *in situ*, consisting of planks measuring approximately 30cm in width and 5cm in thickness.

The floorboards are located directly on the keelson at the extremities of the vessel, with deadwoods providing support towards the center, thereby compensating for the reduction in the height of the frames and ensuring the maintenance of the horizontal plane. The floorboards exhibit variations in their interruption patterns at the mast steps. Specifically, the eastern mast step features a subcircular aperture (which constitutes a part of the mast hole) measuring approximately 80 centimetres in diameter, while the western mast step displays a central opening that can be interpreted as a hatch.

Xylotomical analyses¹³ have demonstrated a prevalence of oak for the skeleton and planking, with exceptions in the floorboards, which is obtained from pine. The choice of oak, typical of Venetian shipbuilding, guaranteed strength and resistance, while different woods were used for the floorboards, probably for reasons of availability or functionality.

The Cargo

The primary cargo comprised limestone blocks, which had been arranged according to two distinct stowage systems. The initial alignment comprised oblong elements, subparallel to the ship's axis and positioned at varying distances to follow the curvature of the bottom¹⁴.



Figure 6. The stone cargo set perpendicular to the ship's axis and the floorboards (Photo by the Author).

¹³ The analyses were carried out at the laboratory of the Centro Agricoltura E Ambiente Srl in San Giovanni in Persiceto (BO, Italy).

¹⁴ They measure on average 250 × 30 × 40cm.

A secondary core, situated between the bow area and the western mast step, consisted of smaller elements arranged perpendicular to the keel line¹⁵. Besides the stone blocks, a significant number of bricks were discovered, some of which exhibited traces of mortar. The presence of a range of sizes, in conjunction with the presence of mortar residues, suggests that this was not a secondary cargo, but rather material utilised as ballast.

In addition to the primary cargo, ceramic and glass fragments were collected, which can be interpreted as the crew's personal belongings. Among these artefacts are a fragment of a Bohemian Schlaggenwald porcelain base, bearing a coat of arms in use since 1867 and two transparent glass vials with embossed letters, probably containers for medicinal or cosmetic substances.



Figure 7. The wooden pulley recovered during the 2022 campaign (Photo by Mirco Cusin).

It is also noteworthy to mention some notable discoveries relating to the ship's rigging, including a substantial wooden pulley (Figure 7), which is likely to be a component of the sail maneuvering system, and a winch. Additionally, two wooden gears, comprising cogwheels of differing diameters yet compatible with each other, were found in the bow area in proximity to a chain. These components can be interpreted as elements of a windlass.

¹⁵ They measure on average 90 x 37 x 26cm.

Sinking Hypothesis

A distinct twisting of the hull is evident, characterised by a progressive inclination of the western part, which reaches 30 degrees, while the eastern part maintains roughly a horizontal orientation. This phenomenon could be attributed to post-depositional events, primarily due to the weight of the load on the waterlogged wood. However, it is more probable that the process occurred during the shipwreck itself. This is a traumatic event by definition, but the shallow water conditions not only favour it but also contribute to other negative factors; for this reason, the phase of navigation in which the vessel is preparing to reach the coast often coincides with the most critical phase. The natural decrease in bathymetry near the coast reduces the draught, i.e. the distance between the waterline and the lowest point of the vessel. In principle, this does not pose a problem in calm seas, provided that the depth is monitored. However, the scenario changes during a storm. In this case, the energy imparted by the wind on the sea surface induces irregular movements of water particles, commonly referred to as waves. Specifically, these consist of vertical oscillations of a column of water along a circular or elliptical orbit, which alternately raises and lowers any object that is afloat on the water's surface.

This phenomenon occurs when a vessel is subjected to the force of a wave trough, which is known to increase in intensity with rising sea conditions. This results in a further reduction in draught, potentially leading the vessel to make contact with the seabed. A 'typical' scenario is one in which the rudder blade breaks, which is usually lower than the keel line. In such cases, the ship is rendered incapable of steering, resulting in it being subjected to the forces of the waves, which cause it to turn sideways and capsize. In contrast to the phenomenon of sinking in deeper waters, in this instance, the waves persist for extended periods, ranging from hours to days. This process of erosion results in the disintegration of parts of the ship's structure, which functions as a transient reef. The fragments of the ship are then dispersed over a substantial area of the seabed, where they undergo a process of erosion.

Such perilous conditions, typically associated with navigating shallow waters during inclement weather, can be exacerbated by the additional burden of transporting a substantial cargo, such as stone, which diminishes the vessel's maneuverability and potentially compromises its stability amidst waves. Consequently, while navigating turbulent waters, the vessel may have foundered prior to reaching the sheltered waters of the lagoon, beyond the barrier islands.

Conclusion

The function of the ship appears to have been that of a transport vessel for building materials, most likely employed to supply Venice and Porto Marghera. Its proximity to the wreck of the Hellmuth, a brigantine carrying a cargo of carbon coke, and to the medieval wrecks Bacàn 1 and Bacàn 2, also carrying stone cargoes, reinforces the hypothesis of specialized commercial traffic along the mouth of the Lido.

The solidity of the starboard side and the structural connection of the hull are indicative of the quality of 19th-century Venetian shipbuilding techniques, while the loss of the port side demonstrates the impact of environmental dynamics on the conservation process. The phenomenon of ‘copri scopri’ (covering and uncovering), accentuated by storm surges and the MOSE works, may have played a decisive role in both the discovery of the wreck and its partial destruction.

From a chronological perspective, the data collected during the 2022 and 2023 campaigns provides a sufficient sample to accurately date the San Nicoletto wreck to the latter half of the 19th century. The dating of this artefact is supported by several converging elements, including the construction characteristics of the hull, which are consistent with 19th-century Venetian shipbuilding practices. In addition, the main cargo of stone blocks and bricks suggests that the artefact was most likely destined for the major construction phase that was taking place in Venice at that time. However, the presence of certain movable artefacts, including Schlaggenwald Bohemian porcelain (Figure 8) dating from after 1867¹⁶, provides a reliable *terminus post quem*.



Figure 8. The fragment of a Bohemian Schlaggenwald porcelain (Photo by the Author).

In conclusion, the shipwreck of San Nicoletto constitutes a substantial testament to Venetian trade in the modern era. Its location, in proximity to one of the perilous sea-lagoon passages¹⁷, serves as a poignant reminder of the challenges that prevailed during the period of navigation with sails alone.

¹⁶ That is, the date from which ‘H&C’ appears on Schlaggenwald ceramic marks. According to E. Poche (1974: Cat. No. 34), the print of the specific mark shown in Figure 8 should be dated to the period 1888-1906.

¹⁷ The danger is evidenced by shipwrecks that occurred even in the Malamocco inlet (Asta *et al.* 2016: 133-5; Capulli 2014: 89-93; D’Agostino and Medas 2017: 105-17).

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New Insights into the Alleged Roman Shipwreck ‘Aura’ off Debeli rtič (Bay of Koper, Slovenia)

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Abstract

This paper examines wooden remains discovered on the seafloor in the northern Bay of Koper, first identified in 2004 and more thoroughly investigated during preventive archaeological research conducted as part of an environmental impact assessment for the test relocation of maritime sediments in 2023 and 2024. Radiocarbon dating, identification of the wood species (*Picea abies*), and the form of the biogenic carbonate concretions that have developed over the remains suggest – albeit with some reservation – that they may originate from a small boat of the Early Imperial period (1st century AD).

The hull, estimated at no more than 15–16 metres in length, and the apparent absence of characteristic cargo, tentatively indicate a small cargo ship or fishing vessel. The presumed wreck had evidently sunk into the soft sediment of the seafloor, where newly established solid ground, now at a depth of 22 metres, provided a suitable environment for the settlement and growth of various epibenthic organisms. These include bioconstructors such as coralline algae, bryozoans, stony corals, and tubular polychaetes, visible in the biogenic layer of calcium carbonate that formed on the wooden remains. Beneath the upper layer of sandy silt, the documented boards likely belong to detached elements of the outer or inner planking, or to the floorboards. The absence of joints, other characteristic ship components, nautical equipment, and cargo necessitates caution in interpreting the remains; therefore, further research is required.

The location of Aura represents an exceptionally interesting archaeological and natural phenomenon that warrants long-term preservation and appropriate legal and technical protection to limit potentially harmful uses of the marine area in question.

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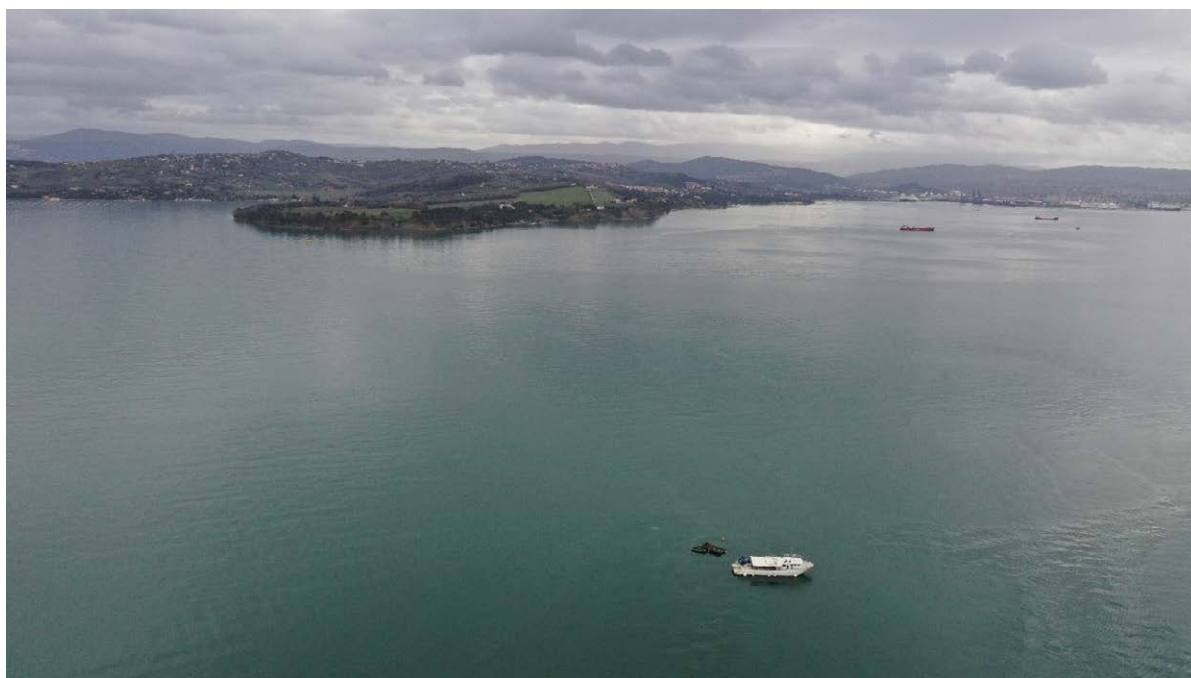


Figure 1. View of Debeli rtič and the Bay of Koper, with work vessels anchored above the location of the presumed remains of a Roman ship during investigations on 29 March 2024 (Photo by A. Gaspari).

Introduction

The underwater remains on the seabed of the Bay of Koper, west of Debeli rtič, were discovered in the summer of 2004 by Jože Žumer (1953–2006) and Alfred Zajič ('Cico', 1952–2013), members of the Scientific Research Section of the Divers of the Port of Koper Club. The discovery resulted from systematic diving surveys aimed at investigating seabed relief anomalies identified through bathymetric measurements. The discoverers reported the presence of wooden remains, encrusted with biogenic carbonate formations, to the Karst Research Institute of the Scientific Research Centre of the Slovenian Academy of Sciences and Arts (ZRC SAZU), the Sergej Mašera Maritime Museum Piran (PMSMP), and the Underwater Archaeology Group of the Institute for the Protection of Cultural Heritage of Slovenia (SPA ZVKDS). The site was designated Aura, a name since adopted by both the diving and professional archaeological communities. In recognition of the contributions of both researchers, this designation is retained in the present study. In 2008, the site was entered in the Register of Immovable Cultural Heritage as Gulf of Trieste - Barge Aura (EID 1-27900).

A preliminary inspection of the site was carried out on 17 June 2005 by A. Gaspari and M. Erič (SPA ZVKDS), accompanied by the discoverers. Due to poor underwater visibility, photographic documentation of the identified features was limited, which also hindered a subsequent inspection in October 2019 by researchers from the Marine Biology Station of the National Institute of Biology and the Institute for Underwater Archaeology, in cooperation with the Centre for Preventive Archaeology of the Institute for the Protection of Cultural Heritage of Slovenia (CPA ZVKDS).

Knowledge of this archaeological and natural phenomenon was significantly expanded through integrated investigations conducted in 2023 and 2024 as part of an environmental impact assessment related to test marine sediment relocation. The research, coordinated by the CPA ZVKDS in collaboration with partner institutions, included high-resolution bathymetric surveying (Sirio d.o.o.), extraction of a geological core to determine sedimentary sequences and their properties (Department of Geology, Faculty of Natural Sciences and Engineering, University of Ljubljana), underwater surveys and inventories of habitat types and associated organisms (Marine Biology Station, NIB), as well as an archaeological underwater survey and targeted investigation of the site (Institute for Underwater Archaeology and the STIK Group, Department of Archaeology, Faculty of Arts, University of Ljubljana) (Figure 1). The latter investigations included the production of a 3D photogrammetric model of the anomaly, the excavation of a small test trench on the southeastern side of the ridge, and taxonomic identification of sampled wooden structural elements (Department of Wood Science, Biotechnical Faculty, University of Ljubljana), along with their radiocarbon dating (Beta Analytic).

Site Description

The site, located at coordinates 45°35'17.87" N, 13°41'01.67" E, is characterised by a circular depression with an approximate diameter of 60m. At its center rises an elongated, irregular ridge-like formation composed of biogenic carbonate deposits. The crest of this formation lies at approximately 20.75m below mean sea level, while the floor of the surrounding depression reaches a depth of 21.5m (Figure 2).

The 3D photogrammetric model produced in 2023 revealed that the ridge-like formation consists of 14 massive, oval, consolidated blocks and several fragmented forms, occupying an area measuring 14.5m along the NW–SE axis and 6.8m along the SW–NE axis. These compact formations, whose crust-like framework is largely composed of coralligenous algae⁶, measure between 130 and 160cm in length and between 74 and 88cm in width (Figure 3). Their surfaces are colonised by red algae and sponges, particularly *Dysidea*, while the seabed in the immediate vicinity is covered with carbonate tube remains of polychaetes and fragments of coralligenous algae.

The surrounding seabed is predominantly muddy, with variable concentrations and spatial distributions of shell debris from marine organisms on the surface (Figure 4). The area is characterised by a muddy detrital bottom assemblage dominated by infaunal organisms living within the sediment. These organisms further structure the seabed surface through burrows and sediment mounds of varying sizes, ranging from a few millimetres to several decimetres. Epibenthic organisms inhabiting the seabed surface are relatively scarce in this environment.

⁶ A comprehensive overview of biogenic formation processes on hard marine substrates is provided by Lipej *et al.* 2016.

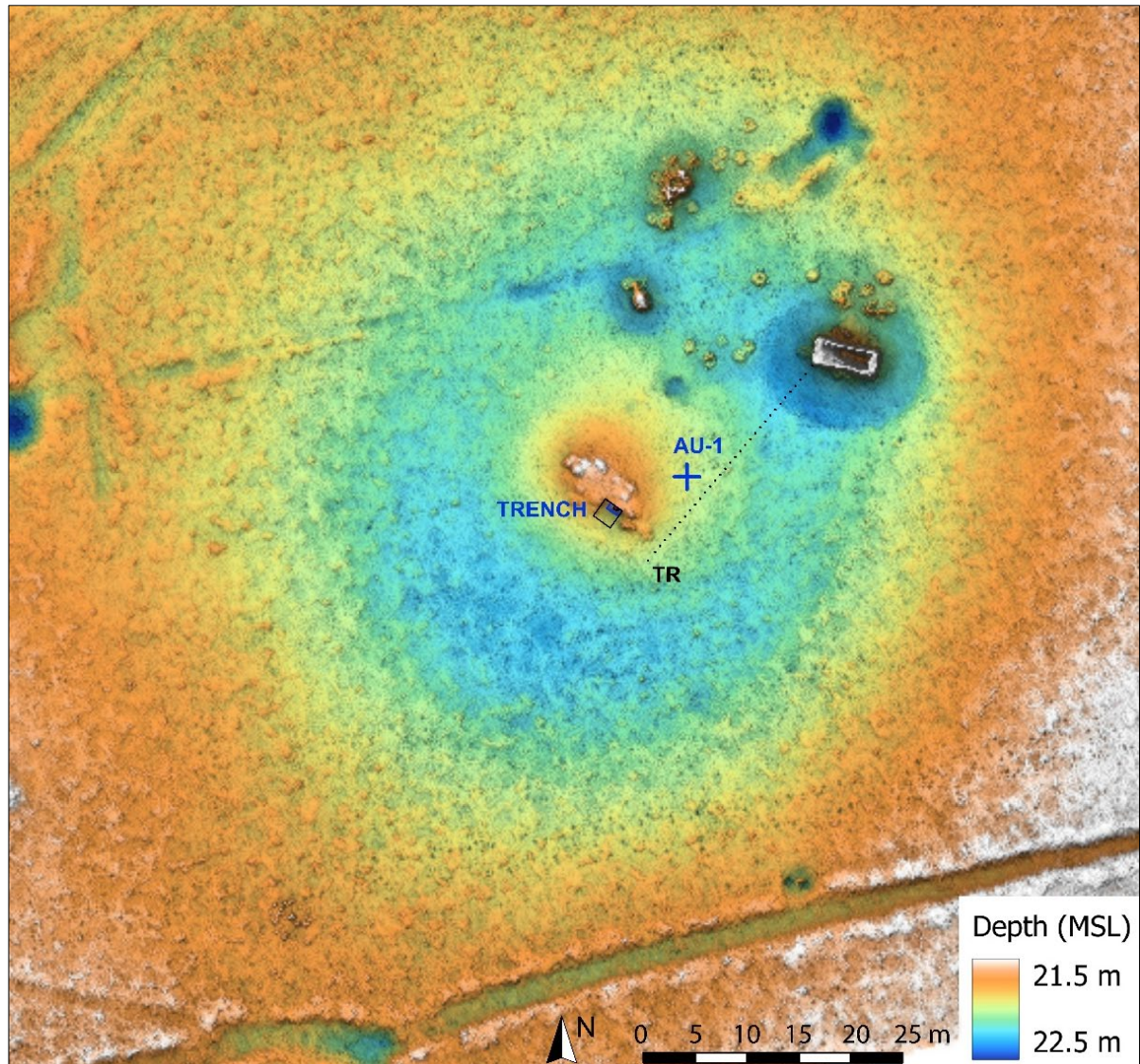


Figure 2. Location of the presumed remains, covered by a biogenic carbonate mound, shown on a high-resolution bathymetric image with the positions of the sediment core (AU-1), archaeological trench (black square), and the direction of the video transect (TR) indicated. To the northeast are the remains of a cargo container, while smaller discarded objects (tyres, a buoy) are present in the immediate vicinity. The elongated anomaly along the southern edge of the image represents a trench formed by the dragging of a cargo ship's anchor (Survey date: 21 March 2024; survey conducted by Sirio company; plan prepared by S. Poglajen and L. Duranka).

Even the initial inspections of the site indicated that the early development of the ridge was facilitated by a wooden substrate - an 'island' of secondary hard bottom. B. Otoničar *et al.* (2005) observed that the slightly elevated position of part of the wooden structure further contributed to the growth of the coralligenous formations, allowing the ridge to develop under somewhat less nutrient-rich conditions than the surrounding seabed. On the surface of the soft sediment surrounding the carbonate blocks, in

addition to smaller fragments of driftwood and rounded flysch stones, individual artefacts were also discovered. Among these, three fragments of Early Modern glazed pottery and a nearly intact small lead ring with a flattened rim are notable; the latter was identified as an Early Modern fishing net weight (Figure 5). These finds most likely represent objects that were accidentally lost or deliberately discarded in connection with fishing activity at this particularly attractive location. The form of the lead weight also has parallels in ancient contexts (see Beltrame 2010), which, although only hypothetical at present, raises the possibility of a closer connection with the investigated wooden remains.

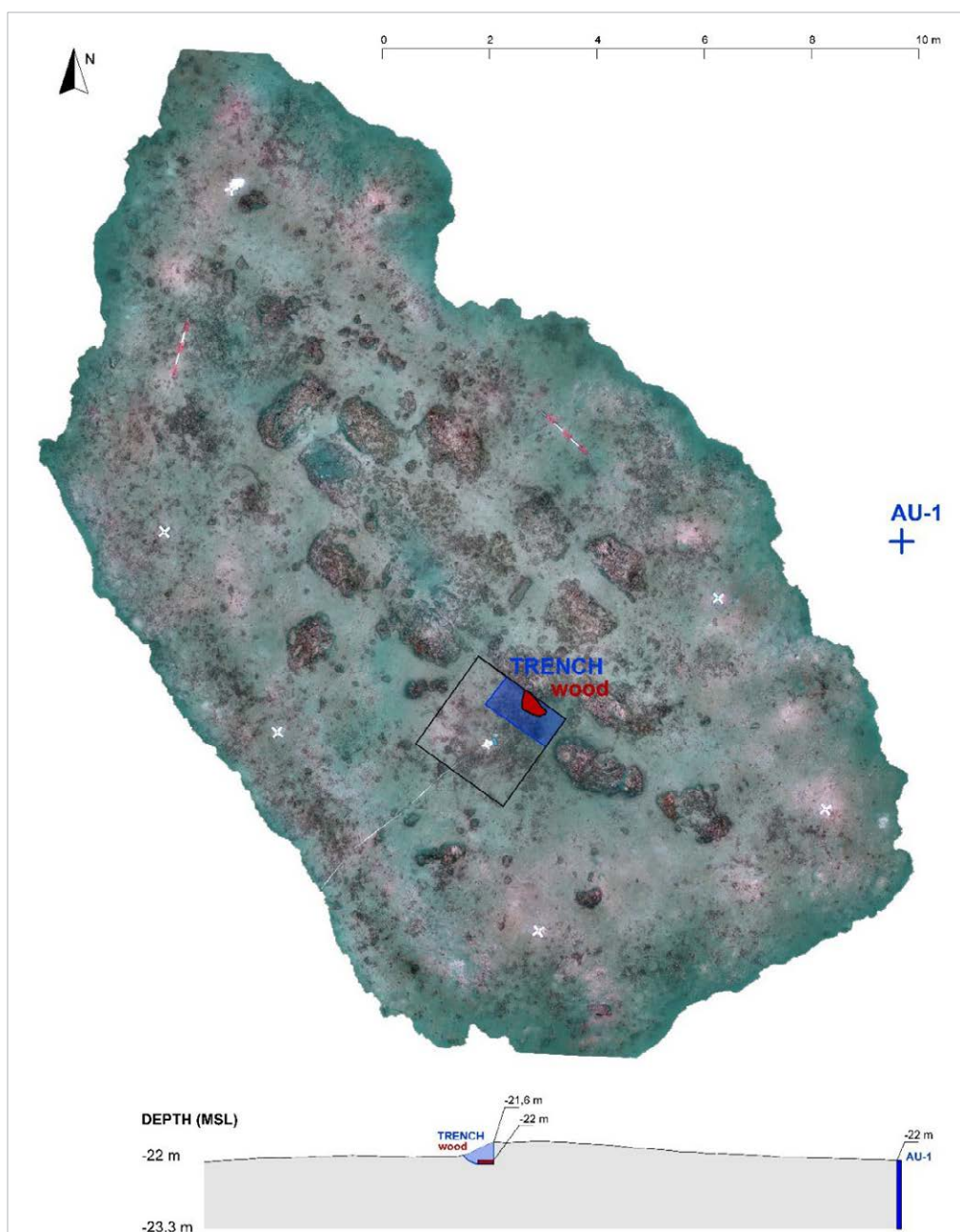


Figure 3. Plan view of the 3D photogrammetric model of the site, with the outline of the quadrant for the 2024 test excavation indicated (3D model by A. Kiss and T. Kiss; rendering by S. Koren and L. Duranka).

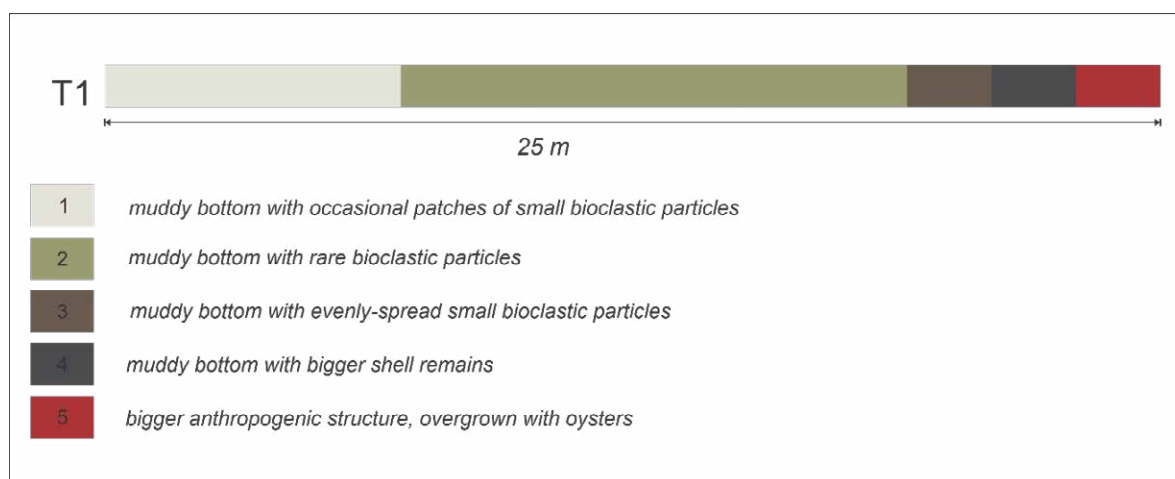


Figure 4. Types of seabed within the area recorded by the video transect (Produced by B. Mavrič).



Figure 5. Deformed circular lead weight in the form of a strip, found near the ridge formation (length 9.1cm; strip width 3.6cm; thickness 0.58–0.62cm; weight 292g; kept by PMSMP).

Geological Investigation of Sediments from the Core Drill

Methodology

At the Aura site, a sedimentary core (AU-1) was extracted at a depth of 21m, located in the lowest part of the depression, just southeast of the ridge. Sediment samples were collected using a partially modified UWITEC gravity corer with a 9cm diameter PVC tube. The length of the core was 125cm. In the laboratory, the sediment core was described sedimentologically, and samples were taken for granulometric and mineralogical analyses.

Granulometric analysis was performed using a laser particle sizer Analysette 22 Fritsch, covering a grain size range from 0.01µm to 2000µm. Mineralogical composition was determined using a Philips PANalytical powder X-ray diffractometer with a 4kW generator (PW3830/40), X-ray tube housing

(PW2773/20-Cu), proportional counter, and graphite monochromator. Measurements were conducted on a PW3710 goniometer with a radius of 17.3cm, over a 2θ range of 3–70° in 0.02° increments, with 0.4 s per step. The total measurement time per sample was 23 minutes. The resulting diffractograms were calibrated and processed using HighScore+ software version 4.8 and the ICSD structural database.

The age of the sedimentary profile associated with the submerged vessel was assessed using three radiocarbon-dated carbonate skeletons of corals and a gastropod (AU-30 – coral; AU-70 – coral; AU-120 – gastropod), sampled at depths of 30, 70, and 120cm. The samples were treated using an acid-etch procedure and analysed via AMS at the Beta Analytic laboratory. Calibration was performed using the MARINE20 curve (Heaton *et al.* 2020), taking into account $\Delta R = 0 \pm 0$.

Core Description

The AURA sediment core (AU-1; Figure 6) consists of predominantly greenish-grey, poorly stratified silty muds and sands. In the upper part of the profile, down to approximately 45cm, more greenish-grey, poorly stratified, slightly clayey sandy silts prevail. These sediments contain darker and lighter irregular patches, along with sparse and very fine fragments of molluscs and black organic matter. At a depth of 25cm, these sediments are interrupted by a 3cm-thick layer of slightly clayey silty sands, containing shell and coral debris.

The central part of the profile, extending to 90cm, consists of grey, slightly clayey silty sands with frequent coral debris (*Cladocora caespitosa* (Linnaeus, 1767)), shells, and gastropod fragments. The lower part of the profile is finer-grained and composed of grey, very slightly sandy clayey silts, with rare remnants of coral, shells, gastropods, and black organic matter.

The mineral composition of the sediments is consistent throughout the profile: the most abundant minerals are quartz, illite, calcite, aragonite, and dolomite, occurring in varying proportions at different depths.

Radiocarbon dating results indicate strongly heterogeneous sedimentation. Sample AU-120 (120cm) was dated to 4425–3939 cal BC, AU-70 (70cm) corresponds to 498–774 cal AD, and AU-30 (30cm) to 1130–1350 cal AD (Figure 7). Interpolation between the dated samples reveals a markedly accelerated sedimentation rate during the last millennium, with an average rate of approximately 0.07cm/year between AU-70 and AU-30, compared to a much slower rate of 0.01cm/year between AU-120 and AU-70 (Figure 8).

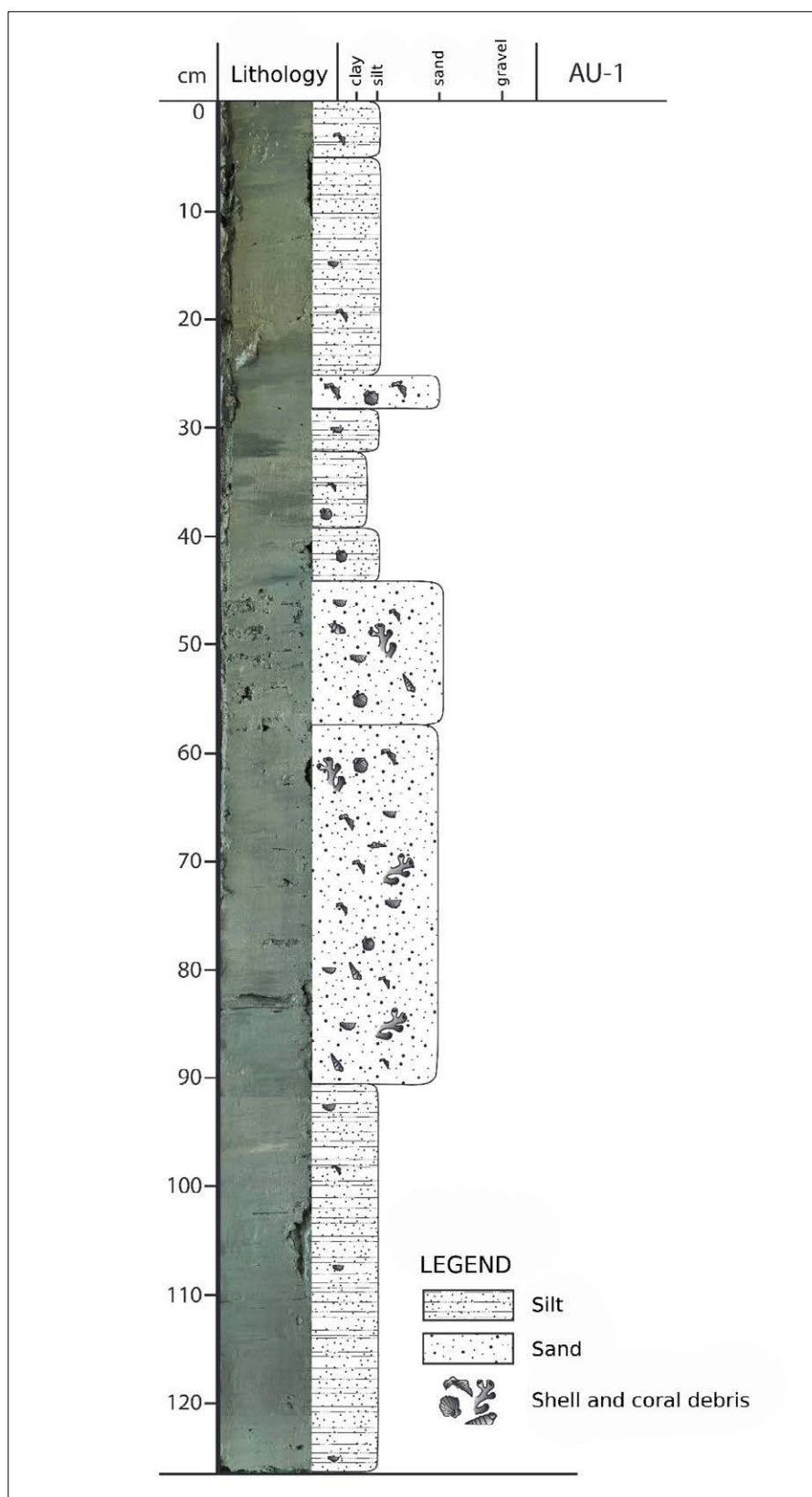


Figure 6. Sedimentological profile at the Aura site (AU-1) (Prepared by A. Šmuc and P. Miklavc).

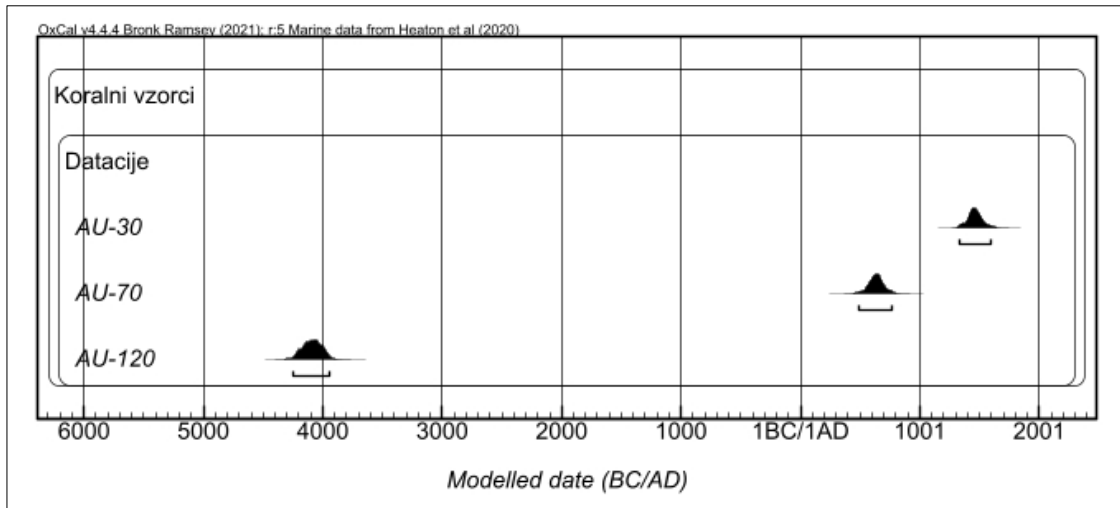


Figure 7. Calibrated radiocarbon dates of carbonate skeletal samples from sediment core AU-1 (OxCal v4.4.4; prepared by M. Dolenec).

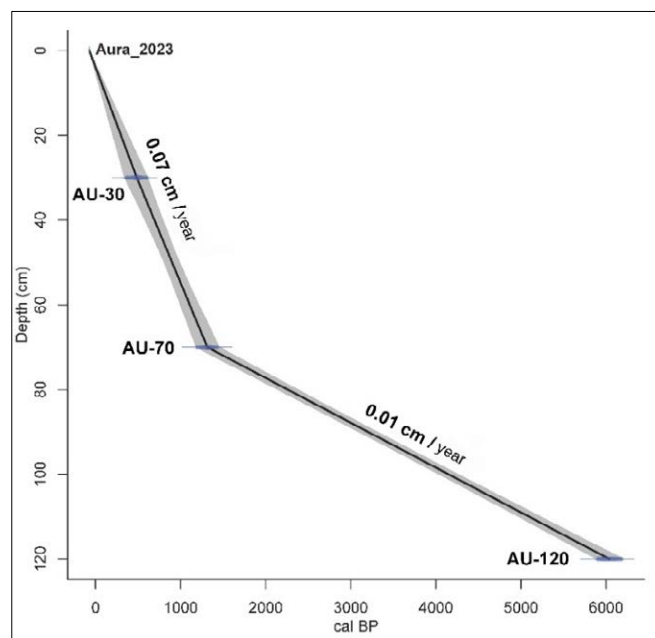


Figure 8. Sedimentation model based on interpolated values between samples AU-30, AU-70, and AU-120 (Prepared by M. Dolenec).

Remains of the Wooden Structure

During a dive on 17 June 2005, wooden remains were identified on the southern side of the ridge in two positions. On the wall of one of the blocks, approximately 0.3-0.5m above the seabed, a vertically oriented, or slightly outward-tilted, board of very dark brown colour was documented photographically. The board extended horizontally, parallel to the formation, and its outer surface was covered with a 1-2 cm-thick biogenic encrustation (Figure 9: a, b). Although the board was not sampled, photographs show a radial cut along the edge, parallel to the long axis.

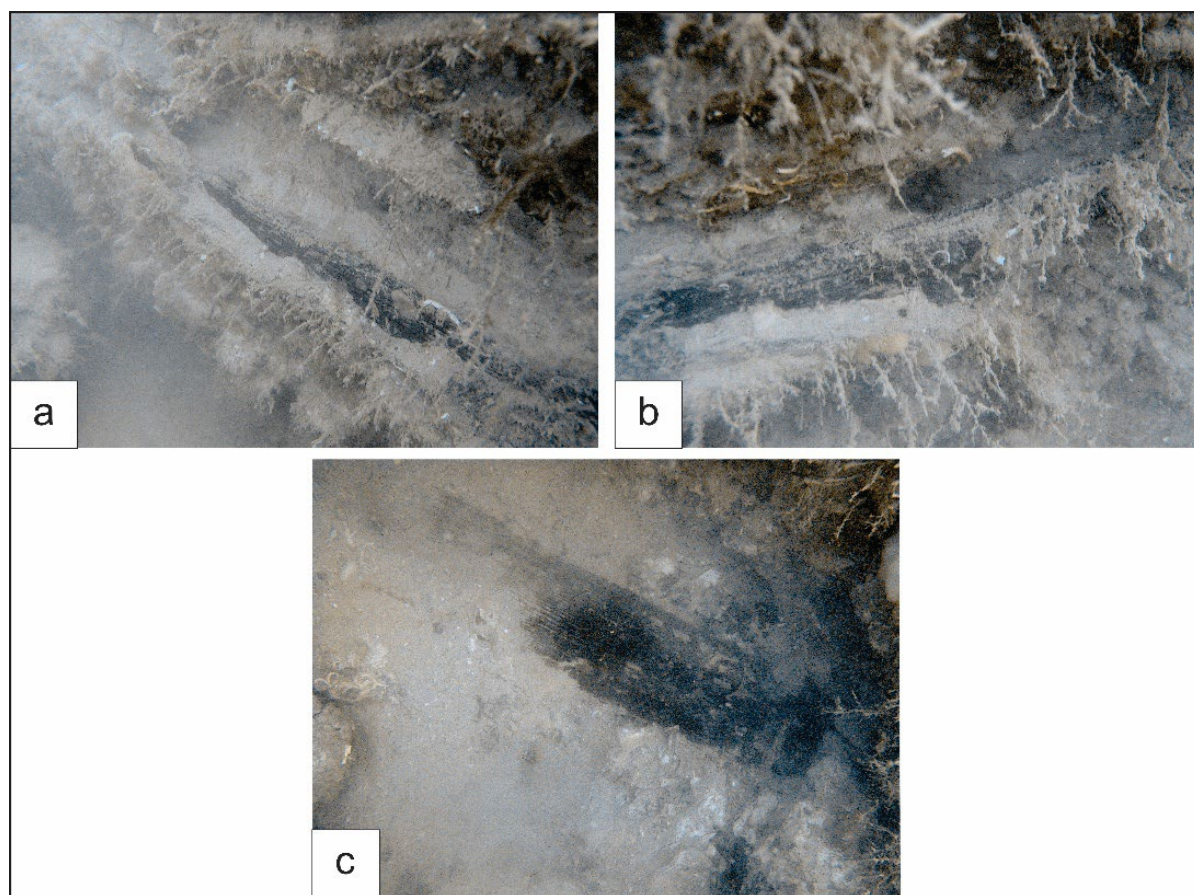


Figure 9. Wooden remains identified during the dive on 17 June 2005: a, b - wooden plank in the southern flank of the formation; c - wooden plank on the seabed near the southern flank of the formation (Photo by A. Gaspari).

Nearby, a second board was uncovered just below the muddy sediment, oriented roughly parallel to the ridge but lying flat on the seabed (Figure 9: c). This is likely part of the same board that A. Zajič retrieved from the site in July 2004 and handed over to Snježana Karinja, curator at PMSMP. This approximately 1 cm-thick, radially cut board, made of spruce (*Picea abies*),⁷ has a dark brown surface with several dark grey to black patches (possibly traces of fire) and is coated on the underside with a few millimetres of carbonate crust. AMS radiocarbon dating of a sample from this board (AEG 01), performed in 2004 at the Leibniz Laboratory, Kiel (KIA 24796) (Erič *et al.* 2012), yielded an age of 1958 ± 22 BP, corresponding to a calibrated range of 26–19 cal BC (0.9%) and 7–125 cal AD (94.5%) at 95.4% probability.⁸ A similar age (1910

⁷ Identification was carried out by M.Sc. Miran Erič, Centre for Preventive Archaeology of the Institute for the Protection of Cultural Heritage of Slovenia.

⁸ OxCal, ver. 4.4.4 (<https://c14.arch.ox.ac.uk/oxcal/OxCal.html#>).

± 80 BP) was obtained from a sample dated in 2005 at the Ruđer Bošković Institute, Zagreb (Z-3467).⁹ The exact sampling locations on the board for both analyses were not documented.

The dimensions of the board, with some reservations, correspond to the planks of hull planking located away from the keel, which in Roman ships typically measure 2–3cm in thickness and up to 22cm in width (Dell’Amico 2001; Beltrame and Gaddi 2007; Radić Rossi and Boetto 2018). However, mortise-and-tenon joints, which would confirm this functional assignment, have not been identified. Alternatively, within the vessel’s construction, the board could represent elements of internal planking or deck structures.

At this location, or in its immediate vicinity, part of a larger wooden element was documented during the excavation of the test trench on 29 March 2024. It was found beneath an approximately 30 cm-thick layer of silt containing coral fragments and detached biogenic structures, with a surface area of about 40 × 25cm (Figure 10). The element comprises two distinct segments: an upper, rough-textured, dark brown section that transitions into a blackened (presumably charred) portion, exposed up to 16cm in width, and a 1–3cm lower, lighter-coloured segment of softened, friable consistency, observed up to 15cm wide. The thickness of the element at the transition between the upper and lower segments is about 4cm. The charred, central, and highest part displays two planes with different orientations. The uneven relief of the charred cross-section indicates that the damage occurred before or during burning. The charred surface is partially overlain by a biogenic carbonate crust.

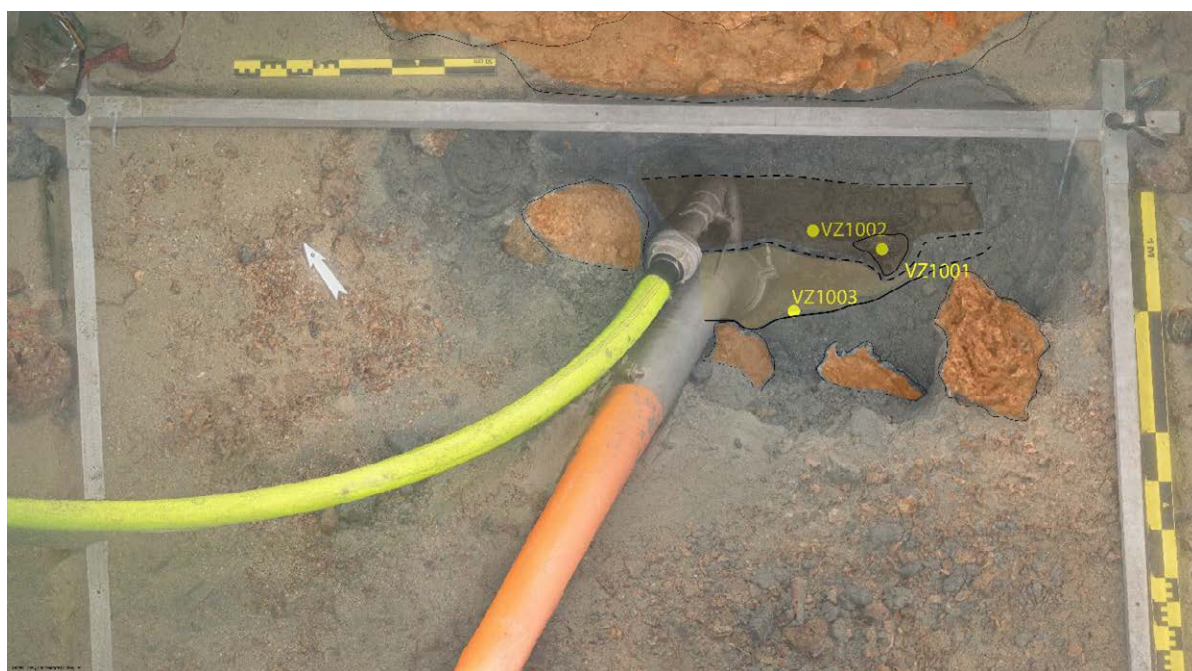


Figure 10. Sketch of the wooden element indicating the locations of sampled sections. View facing north (Based on 3D model; drawing by S. Koren).

⁹ We thank Snježana Karinja, curator at PMSMP, for providing the data on the results of the 14C analysis.

Based on the identical grain orientation and absence of joints, the research team concluded that both segments likely belong to the same element, made of spruce. The parallel and straight planes of the growth rings indicate a peripheral part of a larger-diameter trunk (likely 40cm or more).

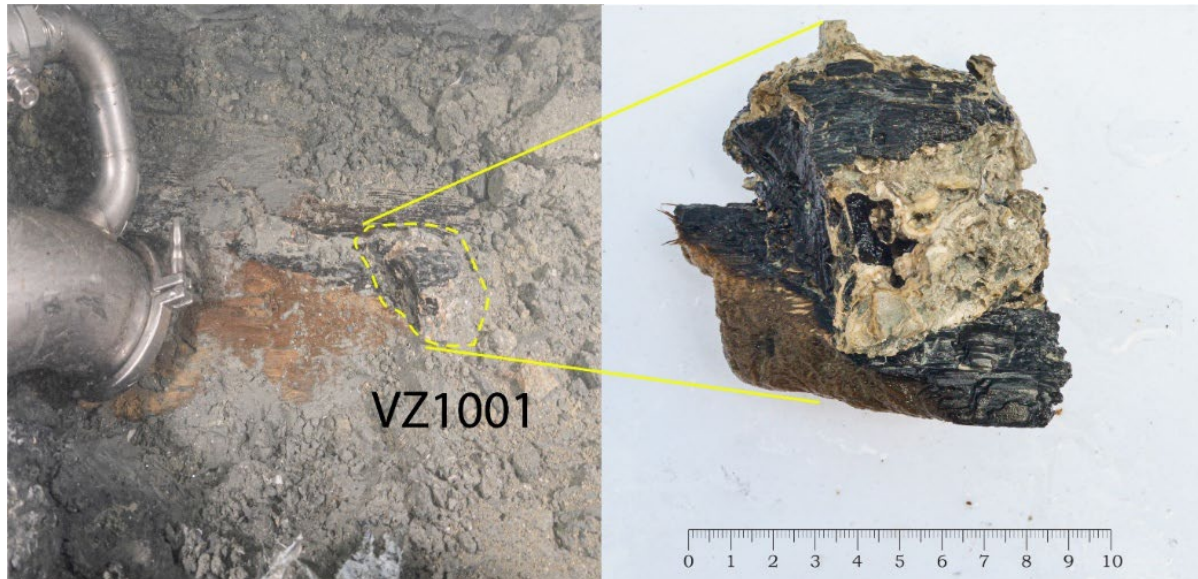


Figure 11. Wooden element at the base of the test excavation showing the VZ 1001 sampling location.
View facing north (Photo by A. Kiss).

The element was sampled in three locations for wood identification and radiocarbon dating. The selected samples included the upper portion near the transition to the lower segment (VZ 1001) (Figures 11 and 12), the central part of the upper segment (VZ 1002), and the outer edge of the lower part of the element (VZ 1003). Wood identification of VZ 1001 confirmed the species as spruce (*Picea abies*).

The relatively wide growth rings indicate favourable wood growth conditions, excluding growth in high-altitude environments or near the upper tree line. The measured mean width of five growth rings in the analysed sample was 3.9mm. The wood presumably grew under good climatic conditions, characteristic of lowland spruce habitats.

AMS dating of the youngest of the 21 growth rings of VZ 1001 yielded an age of 2100 ± 30 BP, corresponding to a calibrated range of 198–42 cal BC (95.5%) and 334–331 cal BC (0.5%). The differences between these dates (Figure 13) are not significant enough to undermine the assumption that the analysed wooden elements belong to the same vessel, that is, a ship from the late Late Republican or early Early Imperial period (end of the 1st century BC – beginning of the 1st century AD).

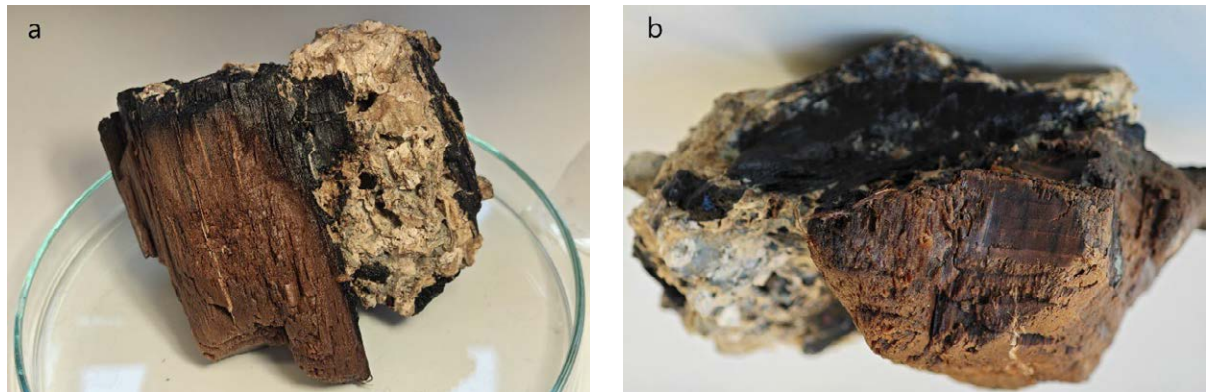


Figure 12. Wood sample (VZ 1001); a – side view; b – cross-section with discernible growth rings (Photo by M. Merela).

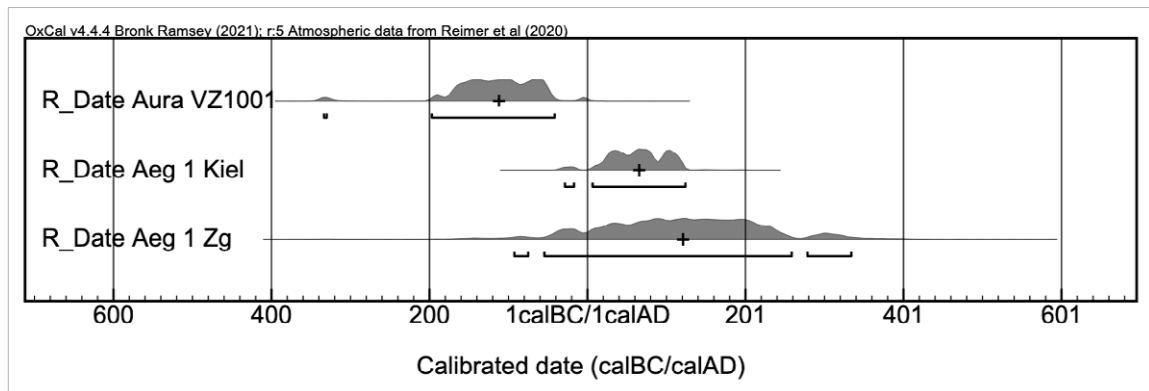


Figure 13. Calibrated radiocarbon dates of wooden elements from the presumed ship (OxCal v4.4.4; prepared by A. Gaspari).

Discussion

Coniferous wood, commonly used for hull planking, internal planking, and deck boards in ancient Mediterranean shipbuilding (Rival 1991; Pomey 1998; Pomey and Rieth 2005), suggests that the vessel was likely a smaller cargo or fishing ship propelled by sails or oars, or perhaps a harbour barge, possibly even a flat-bottomed ship adapted for navigation in marine–riverine or lagoonal environments (*caudicaria*).

The dimensions and symmetrical oval shape of the biogenic formation covering the presumed vessel correspond to smaller cargo ships of the Imperial period, ranging from 8 to 15m in length, and also to *horeia*-type vessels¹⁰ – asymmetrical ships with flat bows – documented in ancient harbours such as

¹⁰ For a recent discussion of archaeological finds of ships attributed to *horeiae*, see (Radić Rossi and Ruff 2024).

Naples,¹¹ Isola Sacra,¹² Pisa,¹³ Toulon,¹⁴ Alexandria (ship J3 - 6m),¹⁵ and Trstenik (ship 2 - 5m).¹⁶ Given the position of the horizontal planks beyond the area of biogenic encrustation, it cannot be excluded that the remains of the wreck extend beneath the sediments in all directions from the ridge. This could indicate a larger Roman cargo ship, approximately 15–18m in length, comparable, for example, to the *Julia Felix* wreck off Grado from the mid-2nd century AD,¹⁷ or to a Late Roman vessel sunk near the islet of Veli Školj off Pakošane.¹⁸

The pronounced charring of the examined wooden elements and evidence of fractures that occurred before or during burning indicate that the presumed shipwreck originated with structural failure of the vessel, which subsequently developed into a fire. This fire may have resulted from negligence during activities at the ship's galley hearth, the presence of flammable cargo, the use of onboard lighting, or even as a consequence of armed conflict. Among ancient Mediterranean shipwrecks, fire-related destruction has been archaeologically documented on vessels from the vicinity of Cape Pointe du Brouil in the Bay of Cavalaire (140–130 BC), the Garonne River near Bordeaux (AD 159–161), near the island of Pomègues (Ship A) in the Bay of Marseille (3rd century AD), in the harbour of Fiumicino (Ship G) near Rome (3rd–4th century AD), and in the area of the island of Laurons (Ship D) in the Gulf of Fos (3rd–4th century AD). Of particular interest is Ship 5 from the site of Thonis–Heracleion in the Nile Delta, dated broadly between the first half and the mid-4th century BC. This vessel, approximately 14–15m in length, sank as a result of a fire damage, as evidenced by charred planking, frames, and ropes, and is thought to have been lost during a military engagement, as indicated by associated finds of lead projectiles and a Greek helmet of the Chalcidian type.

¹¹ Ship A, dated to the 1st century AD, has a preserved length of 11.77m; Ship F, dated to the 2nd or 3rd century AD, has a preserved length of 8.5m; Ship C, dated to the 1st century AD, is preserved as a horeia with an approximate length of 13m; and Ship G, dated to the 2nd or 3rd century AD, is also a horeia, preserved with a length of 7.6m (Boetto 2009).

¹² Ship 1, dated to before the first half of the 3rd century AD, has a preserved length of approximately 12m and is interpreted as a horeia (Boetto *et al.* 2009).

¹³ Ship C is an approximately 14 m-long river barge from the Augustan–Tiberian period (Bargagli 2005).

¹⁴ Two horeia-type vessels, dated to the late 1st century AD, have preserved lengths of 8.5m and 6.3m (Brun 1999).

¹⁵ A small vessel (J3), approximately 6 m in length and dated to the 1st or 2nd century AD, was discovered in the eastern harbour (*Portus Magnus*) of Alexandria and is interpreted as an auxiliary craft associated with a larger ship (Robinson and Godio 2025).

¹⁶ The Trstenik 2 vessel, with a length of 5m and radiocarbon-dated to between 41 BC and AD 124, is one of three ships discovered in 2006 and 2020 at the Trstenik site in Kaštel Sućurac (Radić Rossi and Ruff 2024).

¹⁷ Preserved length: 13.1m; preserved width: 6.1m; estimated length: 15–18m; width: 5–6m; central height: 1.8–2m (Dell'Amico 2001; Beltrame and Gaddi 2007).

¹⁸ Estimated length: 15–20m (Radić Rossi and Boetto 2018).

Although the evidence from the Aura site is modest – limited primarily to the form and intensity of charring observed on fragments of the wooden structure – it may nevertheless be compared with findings and hypotheses concerning the sequence of events during the Byzantine merchant shipwreck Rhodes 4, a 12th-century amphora-carrying vessel located in the harbour of the city of Rhodes and partially investigated during rescue excavations in 2008. At that site, traces of both intense burning and surface charring were present on most wooden components of the vessel, while exposure to very high temperatures was also reflected in the cargo remains, preserved as a compact, approximately 1 m-thick layer of amphora sherds (Koutsoufakis and Rieth 2021: 94, 96, Figs. 17, 18, 22).¹⁹

At the current stage of research, no more specific conclusions can be drawn regarding the functional or structural relationship between the documented wooden remains of the presumed Aura vessel and their original positions within the ship's structure. It is, however, noteworthy that the elements are vertically separated by at least 0.5m. Importantly, the horizontal wooden element uncovered during the 2024 test excavation is overlain by a 30cm-thick layer of silt, as is the case for the board recovered from the site in 2004. This observation supports the interpretation that these are fallen planks from the outer hull or other structural elements from the upper part of the ship's hull, which reached their current position shortly after sinking. In this scenario, the lower part of the hull would be embedded within silty sands and silts (Figure 9). This hypothesis is supported by data from the sediment core profile. The oldest sediments in the core date to 4425–3939 cal BC and represent the seabed into which the vessel became embedded. Sedimentation rates during this period were low, indicating a relatively stable marine environment in the early Holocene. A substantial change in sedimentation occurred after the vessel sank, as sedimentation rates in the upper part of the profile increased by approximately sixfold. The submerged ship acted on the seabed as a solid nucleus colonised by marine organisms and simultaneously functioned as a 'trap' for fine-grained clastic marine sediment, representing a geomorphological disturbance and barrier on an otherwise relatively flat seabed.

Conclusion

The investigations confirm the hypothesis that the ridge-like formation with a biogenic carbonate framework developed on the remains of a Roman-period vessel, most likely a smaller ship approximately 15m long. Based on the identified wood species, the vessel was probably constructed somewhere along the eastern coast of the northern Adriatic. Radiocarbon dating of the wooden elements along the southern margin of the biogenic carbonate formation, together with the overlying

¹⁹ The fire affected a large portion of the southern end of the vessel, while no traces of fire were identified at the northern end. The western side of the southern section was more heavily affected; however, on both the western and eastern sides, the fire did not reach areas below the lowest deck. The evidence suggests that the vessel heeled during the fire. Inclination along both the longitudinal and transverse axes caused the fire to be extinguished first at the northern end and on the western side of the ship, while lower parts of the hull - normally below the waterline - were exposed.

silty sediments, indicates that the ship most likely sank during the Early Imperial period. The relatively rapid accumulation of sediments around the wreck may also explain the absence, or only limited development, of biogenic carbonate encrustation on the upper surfaces of the documented wooden elements, in contrast to the presumed wooden structures or possible cargo remains beneath the ridge. Future research will therefore focus not only on defining the structural and functional characteristics of the vessel, but also on addressing questions related to the chronological dynamics of the growth of bioconstructing organisms and the consequent development of the biogenic carbonate framework of the ridge-like formation, as well as the condition and evolution of the marine environment and the surrounding seabed.

Further investigations are also required due to the direct threats to the remains at the site from maritime traffic, particularly the anchoring of cargo vessels, as well as potential alterations resulting from sediment relocation from navigation corridors serving the Port of Koper. These activities will inevitably require introducing restrictions or prohibitions on certain categories of use of this section of the seabed, as well as establishing regular monitoring, including installing markers and periodically acquiring high-resolution 3D photogrammetric models.

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A 15th–17th Century Beech Logboat from Lake Bohinj (Slovenia): Wood Identification, Construction, and Function

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Abstract

This paper discusses the logboat from Lake Bohinj, discovered in 2001 by police divers at a depth of 32m near the south shore, not far from the Church of the Holy Spirit. The boat, measuring just over 4m, was documented and sampled during research dives in 2025. It is made from a beech log that was felled between the second half of the 15th century and the first half of the 17th century, as determined by radiocarbon (AMS) dating of the terminal tree rings. Probable uses of the boat include economic activities such as personal transport and fishing, as well as supplying the Church of the Holy Spirit. The shape, dimensions, and internal arrangement are most similar to those of early modern fishing logboats from the Balkans and Eastern Europe.

Introduction

The 44.5-metre-deep Lake Bohinj (526m a.s.l.) (Firbas 2001; Zorn 2010), situated in the central part of the Julian Alps in the Gorenjska region, is the largest natural freshwater lake in Slovenia, with an area of 3.18sq km. Archaeologically, it is poorly known and has not yet been the subject of extensive research. In addition to the lake's role as a transport route and possibly other medium, its archaeological potential is indicated by a presumably late medieval or early modern logboat sunked with stones in a bay northwest of the lake's outflow,⁵ and by a logboat found near the Church of the Holy Spirit (Sv. Duh) on the southern shore, which is the central find discussed in this contribution (Figure 1). The detectability of submerged archaeological remains is directly related to the morphology of the tectonic-glacial lake

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⁵ Information provided by archaeologist-diver Rafko Urankar, PJP company. It is a logboat approximately 5m long and 0.4m wide, with rounded sides, a flat bottom, and straight ends. One end is broken off and embedded in silty sediment. The interior of the vessel, which is not heavily silted, is loaded with larger stones.

basin and the sediments that fill it. Knowledge of these features derives from a bathymetric survey using multibeam sonar conducted in 2016, as well as from dives by experts, members of government services, and local diving clubs since 1996.



Figure 1. Lake Bohinj with the marked location of the logboat (Photo by Mojca Odar, MOMA production. Courtesy of Urška Golob, Turizem Bohinj).

Most of the littoral areas of the lake basin, in places down to a depth of 15m, are covered by gravel and sand, which at greater depths transition into carbonate silt and clay. The transition from the shallower western basin to the deeper and larger eastern basin is marked by a ridge-like abraded rock surface, exposed down to a depth of 30m. Analyses of the upper part of the sedimentary sequence from a 12m deep core (May 2012) taken from the deepest part of the eastern basin, reaching into the period after 6600 years before present (BP), showed that the upper 20cm of deposits began to accumulate sometime between 552 and 662 BP (Andrič *et al.* 2020). The direct visibility of archaeologically significant remains depends on water transparency, which varies with depth and season, that is, with the stratification of the lake water according to hydrometeorological conditions during a given period. Of particular importance is a layer of organic suspended matter that rises and sinks at greater depths, within which visibility is zero. Bathymetric images of the slopes and flattened areas of the lakebed reveal cut logs that can easily be mistaken for ancient vessels without diver verification, while the 2016 multibeam sonar survey shows a few more recent, modern boats, for example, in the bay near Zlatorog.

Discovery and Documentation of the Logboat

The logboat was accidentally discovered in June 2001 by Milan Tomažin, Zlatko Rizvič, and their colleagues, members of the Special Unit of the General Police Directorate of the Ministry of the Interior, during a training dive. Officer Tomažin took an excellent photograph of his colleague above the exposed part of the logboat, which he later, in 2012, provided for publication on the cover of the monograph *Submerged Past* (Gaspari and Erič 2012).

After numerous attempts, the logboat was rediscovered and located by archaeologist-diver Borut Slokan and Gregor Trošt, members of the Association of Rescue Divers of Slovenia (ZRPS). The search was conducted under challenging conditions, including a large search area, highly variable visibility (0–5m), complete darkness, and low water temperatures (5–7 °C).

All dives were conducted as decompression dives. The divers used two 12L cylinders and/or closed-circuit rebreathers, supplemented with stage cylinders for reserve gas and decompression stops, as well as underwater scooters to facilitate navigation over the research area. After the discovery, the logboat was marked with a metal anchor and a marker line leading to the shore (north–south direction). Subsequent dives focused on 3D documentation of the logboat using underwater photography, collection of samples for xylotomical analysis and AMS dating, and recording of precise coordinates using the UWIS GPS system.⁶

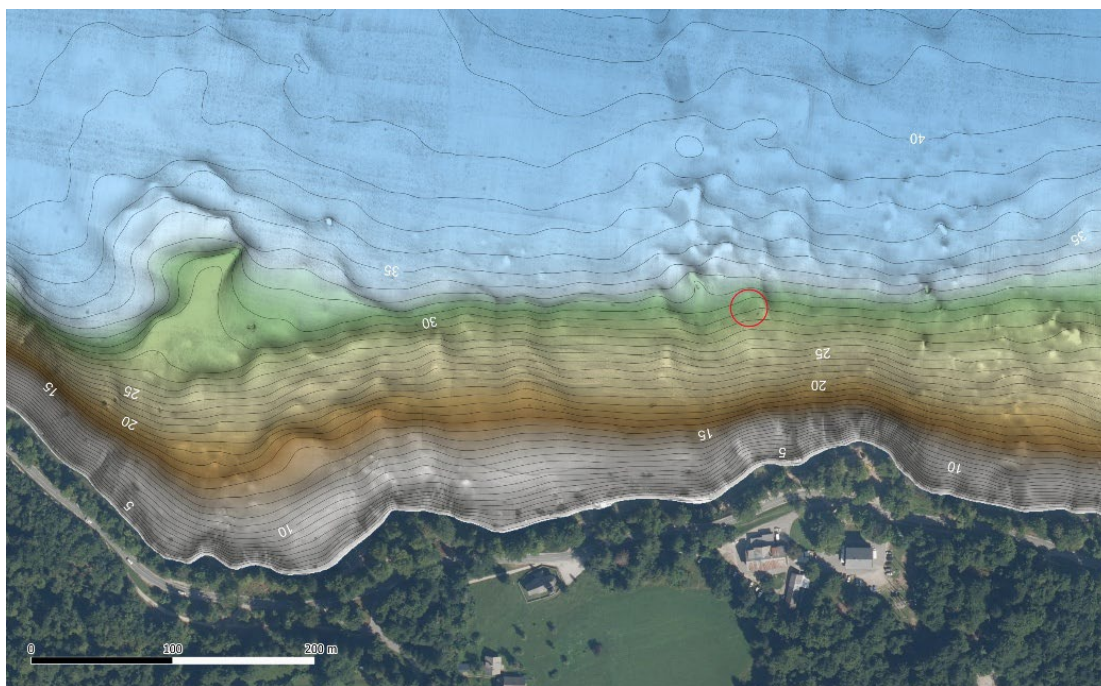


Figure 2. Location of the logboat on the bathymetric survey map
(Base map by Sašo Poglajen, HarphaSea company, 2016).

⁶ Specialised underwater equipment for surveying and documenting the research area was provided by Gašper Košir (CPA Company).

Location

The logboat sank or slid onto the silted lakebed at a depth of 32m, about 150m from the southern shore of the lake near the Church of St. Spirit (Figure 2). It lies on a flat area, some distance (ca. 100m) from the break in slope leading into the level part of the eastern lake basin, partially embedded in compact mud and oriented parallel to the shore in an east–west direction.

The bow and stern are exposed and undercut by habitats of lake animals, while the interior of the central part of the logboat is filled with silt. The thickness of the silt in the relatively flat surroundings of the logboat (at depths of 30–35m) reaches at least 1.2m, whereas on the break into the steep slope towards the coast, at a depth of 15m, the silt layer is reduced to approximately 30cm. A comparison of the current situation with the condition documented in the 2001 photograph, after a quarter of a century, shows that the appearance of the site is practically unchanged.

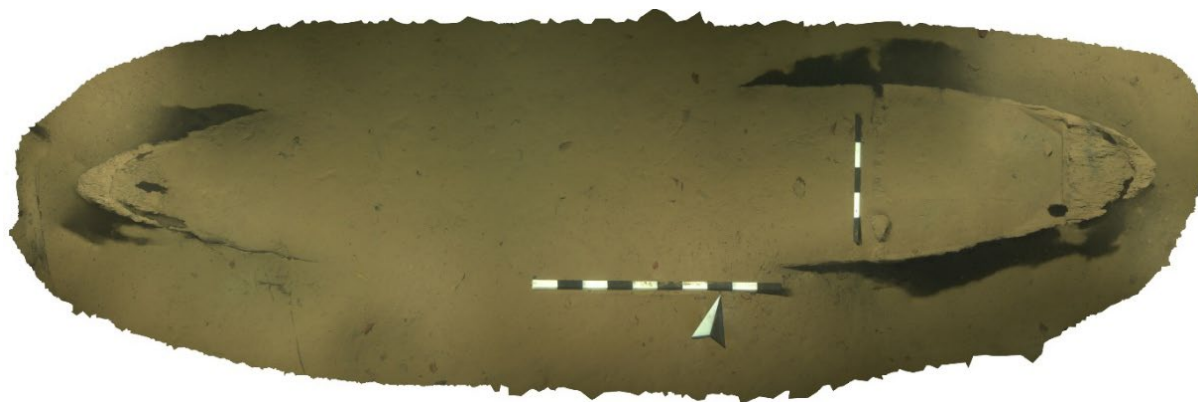


Figure 3. Three-dimensional representation of the logboat (Elaboration by B. Slokan).

Characteristics of the Vessel

Form and Dimensions

The logboat, with an oval-conical outline, is 4.3m long and 0.7m wide. Its height at the central part is estimated at 0.3m. In cross-section, the vessel retains the shape of the tree trunk, possibly with a slightly flattened bottom, while in longitudinal section it shows a shaped, flattened – rounded form, with the bow and stern raised relative to the sides and tapering to pointed ends (Figure 3).

The wider eastern part is identified as the presumed stern, characterised by a compact tip and a transverse rib. The tip itself retains the mass of the wood and has a low circumferential rim, about 8 cm high, created by lowering the inner surface of the tip. The internal length of the stepped arrangement of the stern, interpreted as a possible seat, measures 0.27m, and its width 0.34m. It is separated from the transverse rib with vertical walls, hewn from the parent trunk, by a compartment approximately 0.71m

long, representing 16.5% of the total length of the logboat.⁷ As the rib extends to the top of the sides, it most likely represents a functional feature related to the position of the helmsman or paddler (McGrail 1978: 318; 1998: 75-6). The upper surface of the rib, about 0.07m wide, is considerably deteriorated.

The space from the rib towards the bow is a few centimetres wider than the presumed stern area, and its larger volume suggests a working or cargo space. The narrower part of the logboat, presumed to be the bow (Figure 4), ends in a reinforced tip with a similar outline to that of the stern (Figure 5), but without a massive step and with a less rounded profile. The visible part of the bow section of the bottom and part of the sidewalls shows damage, namely, longitudinal cracks in the bottom and broken-off rim of the sidewalls, the cause of which cannot currently be explained.



Figure 4. Degraded bow area with the remains of the iron clamp (Photo by B. Slokan).

Inside, just before the bow on the left half of the bottom, a short transverse yellowish element is visible, identified as a rusted iron clamp (Figure 4), presumably a repair of a longitudinal crack. About 0.8m from the bow, at the beginning of the flattened central part of the logboat, a massive piece of wood is noticeable along the left side, possibly the terminal segment of another transverse rib. The exterior

⁷ Basic form of the logboat according to (Arnold 1996): H; cross-section: A-0 or A-1/10; shape of the ends: E (*elliptique*); flat-cut bow of type h1 (*bout tronqué*); internal form of the stern: a'2 (*transversaux massifs/gradins*); transverse rib: type c4.

surface of the logboat is smoothly finished and, over a significant area, shows a charred exterior, which - taking into account the type of wood - is understood as a measure to improve resistance and increase the durability of the vessel.



Figure 5. Port side of the stern with charred areas on the exterior surface. X marks the location where the sample was taken for radiocarbon (AMS) analysis (see Figure 7) (Photo by B. Slokan).

Wood Selection

Analysis of the sample conducted at the laboratory of the Chair of Wood Technology, Department of Wood Science and Technology, Biotechnical Faculty, University of Ljubljana, revealed that the wood is beech (*Fagus sylvatica* L.). Microscopic analysis showed that it is a diffuse-porous species. In the cross and tangential sections, both narrow (2-4 cells wide) and wide (more than 10 cells wide) rays are clearly visible. Detailed analysis of the wood structure further indicates that the fibre cell walls of the examined wood are already severely degraded, suggesting poor preservation of the wood structure (Figure 6).

This species is generally less resistant to moist conditions and is therefore a rare - though not entirely absent - choice for structures that come into contact with water, including vessels or their components. In traditional practice, the durability of fresh, non-dried beech wood in water has been compared to that of larch (Zalokar 1854: 302, 309). Nevertheless, under outdoor conditions, beech is among the least durable species with respect to resistance to biotic agents such as wood-decaying fungi and wood-boring insects.

The use of beech for the log under consideration therefore likely reflects factors other than the suitability of its material properties and is most probably related to the wide distribution of this tree species, which during periods of predominantly natural forest development in the study area may have accounted for more than half of the total timber stock.



Figure 6. Wood sample (VZ 1001), light microscopy: (a) cross section, (b) radial section, (c) tangential section (Photo by M. Merela).

According to the pollen record from the mentioned core in the eastern part of the lake, beech began to dominate this area around 3300 years ago (Andrič *et al.* 2020). With intensified logging between 1100 and 950 BP (AD 850-1200), associated with the increased settlement of Bohinj, and especially during the rise of ironworking in the 12th-14th centuries, the proportion of this tree species noticeably decreased. Its renewed occurrence after 500 BP (AD 1450) is cautiously linked by Andrič *et al.* (2020) to plague epidemics documented in the 14th century and in 1510 (Gestrin 1984: 35).

Archaeological evidence for the use of beech in boat construction in the broader Southeastern Alpine area is limited to the planks of an Early Roman barge from the Ljubljana near Sinja Gorica (Erič *et al.* 2014: 197-9; Čufar *et al.* 2014) and an undated logboat from the Božje polje site on the Ljubljana Marshes, where oak (*Quercus* sp.) clearly predominates among the wood species used for logboats, followed by spruce (*Picea abies*) (Erič 2008; Veranič 2016; see also Gaspari *et al.* 2017: 91-3). Beech is among the tree species rarely used for logboats in the broader European area and usually only in later periods (see Arnold 1996: 32).⁸ In this context, throughout the Late Prehistory and Antiquity, oak predominance is typical (Arnold 1996: 54, 157), followed by a more or less noticeable decline in the use of this tree species in some areas and the manufacture of logboats from other deciduous and coniferous trees. Besides beech, these include primarily pine (*Pinus* spp.), black alder (*Alnus glutinosa*), elm (*Ulmus* spp.), ash (*Fraxinus* spp.), spruce (*Picea abies*), poplar (*Populus* spp.), and fir (*Abies alba*) (see Gaspari *et al.* 2017: 93). In the Alpine region, a somewhat higher proportion of conifers is generally observed among the trees used for logboats. A slightly shaped and sized early medieval logboat from Lake Bled beneath Castle

⁸ One exception is the Early Iron Age logboat from Lake Lubanowo in Western Pomerania (Kontny 2021), which is also the only beech logboat among more than 200 documented vessels of this type in Poland (Pazdur *et al.* 2001).

Rock is made of larch (*Larix decidua*), while the partially documented early medieval logboat from the lake near Otok is, interestingly, made of linden (*Tilia* sp.) (Gaspari *et al.* 2022).

The specific weight of freshly cut linden wood is roughly half that of oak, making logboats made from this deciduous species easier to manoeuvre, especially on smaller waterways, and easier to haul onto land or even carry. The weight of fresh beech wood (950–1250 kg/m³) is comparable to that of oak, so the choice of wood for the logboat under study – relatively small and clearly adapted for personal transport, fishing, and other less intensive activities – was influenced by the local availability of this tree species.

The shaping of denser deciduous wood (e.g., oak) was carried out immediately or up to six months after felling, while the trunk was still fresh enough for processing (Gregory 1997: 60–71). In contrast, a description of the manufacture of a spruce logboat on Lake Mondsee near Salzburg in the 1930s reports that the roughly shaped vessel was submerged to a depth of 2 metres, weighted with stones and anchored with four stakes, remaining underwater for 15 to 60 years, with the longest known duration being 102 years (Salemke 1973).

Charring of the Exterior Surface

Traces of charring on the exterior surface (Figures 5 and 7) are significantly rarer in the archaeological record of the wider European area than charred sections of the interior of logboats. Many specialists interpret these internal charred areas – supported by ethnographic evidence – as evidence of hollowing out trunks using a combination of burning and adzing (see Arnold 1996), while some researchers attribute the charred patches to remnants of hearths (e.g. Mainberger 2016: 346–8). Opinions are also divided regarding charring as a method for hardening and preserving the sidewalls of logboats (McGrail 1978: 34, 63–5; 1998: 63; Gregory 1997: 71–2; Unger *et al.* 2001; Esteves Pereira 2009). Ethnographic evidence clearly shows that even this type of vessel received protective treatment in the final stages of manufacture to prevent wood decay, cracking, and insect damage.⁹



Figure 7. Wood sample (VZ 1001) showing clear signs of charring, taken from the starboard side of the stern (Photo by M. Merela).

⁹ Charring induces thermal degradation of cellulose and hemicellulose, resulting in an increased relative proportion of lignin. These chemical changes render the wood more hydrophobic and less hygroscopic, thereby reducing its moisture content and limiting conditions favorable for fungal growth. Thermal modification also alters the nutrient composition of the wood, making it less attractive to insects.

Charring was followed by the removal of coarse charred material, rubbing, and the application of fat (McGrail 1998: 63), as also documented in the surface finishing of monoxyl canoes used for whaling along the north-western coast of America (Arima 1975: 77-9). Insights from the construction of a replica medieval logboat from the Seine at Nemours in 1994 identified the purposes of charring as the removal of splinters in the final surface finishing, shaping the tips of the bow and stern, and protecting the wood against insect attack and fungal growth (Bonnin 2003: 38-9).

Radiocarbon Dating

Radiocarbon (AMS) dating of the wood sample (Boh-01), taken from the youngest tree-rings of the presumed right side at the stern rib (Figure 5: x), was carried out at the laboratory of Beta Analytic in Miami (FL) in November 2025 (Beta-786888).

The report of the analysis, dated 5 December 2025, gives a conventional radiocarbon age of 350 ± 30 BP, which with 95.4% probability allows the felling of the tree used to make the logboat to be placed in the period 1539–1635 (55.6%) or 1460–1529 (39.8%) (Figure 8),¹⁰ i.e., at the transition from the Late Middle Ages to the Early Modern period.

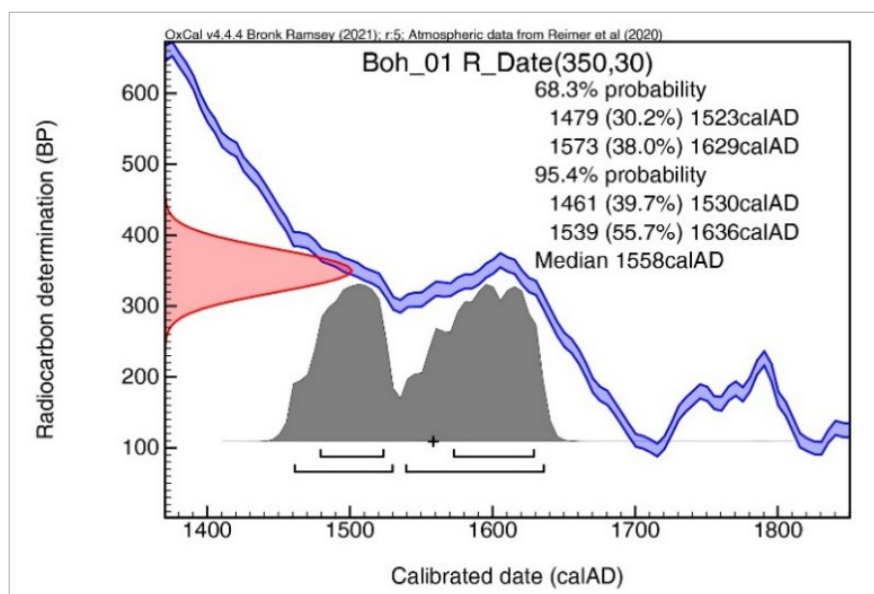


Figure 8. Calibration curve of the radiocarbon (AMS) dating (OxCal v4.4.4 version).

Comment on the Form

In the broader European area, similar stern designs to that of the Bohinj logboat - with a massive tip, raised rim, and nearby rib - can be found in two larger Iron Age logboats from Lake Sanguinet in Aquitaine (Dubos 2006: Figs. 26, 50), in an oak logboat (2151-1997 BC) from the Federseeried marsh

¹⁰ Calibration: BetaCal 5.0; INTCAL20.

(1928/5) in Baden-Württemberg (Mainberger 2016: 354, Fig. 10), and in the similarly shaped ends of two oak logboats from the Kupa riverbed in Sisak (202 BC and AD 25) (Škrgulja 2018: 64–7). A comparable end design is also seen in a 4.65m long early medieval oak logboat of rectangular cross-section from Llyn Llangorse in Wales, which McGrail defines as a personal transport vessel, propelled with a pole or paddle at a lower average speed, with a maximum load of 250kg under standard freeboard (McGrail 1978: 233–6, Fig. 29).

It should be emphasised that these so-called ‘seats’ are generally more massive ends; in the case of the 5.1m long oak logboat from Saint-Anne-de-Campbon (Loire-Atlantique), both ends are shaped in this way, with one being more conical than the other (Arnold 1985: 215, Fig. 8.82). Even more striking is the step in the massive end with an extended tip of the originally 7.5m long and up to 0.5m wide logboat (Viminacium 1; 7th–9th century AD), discovered in 2020 in the sediments at the Mlava River outlet into the Danube near Kostolac (Serbia). The authors interpret this step as a bench (Danković *et al.* 2024: 248, Fig. 4). The identification of the end of the Bohinj logboat as a seat is only preliminary and must be approached with caution, as a similarly hollowed end with a low rim is found on a larger Late Medieval (1480–1670) spruce logboat from the Ljubljana near Podpeč, where the so-called step is too narrow to function as a seat (Erič 2008: 21, Fig. 25).

The functional interpretation of the examined parts of the logboat is further supported by the example of a 3.1m long and up to 0.63m wide logboat from the Kupa River near the village of Rečica, not far from Karlovac, radiocarbon (AMS) dated to 335 ± 25 BP, approximately the 16th century. The boat has a 12cm wide rib on the wider stern section, interpreted as a seat, and towards the narrower bow, two narrower and lower ribs that delimit the cargo space. Among analogies for the vessel’s shape and rib arrangement, the authors also mention an undated logboat from the Danube near Sotin in Croatia and several logboats from Russia and Ukraine, with dates ranging from prehistory to the 16th century (Šimičić and Bekić 2015). Notable among these is a 3.93m long, 0.55m wide, and 0.18m high logboat from the Orel River, characterised by an oval-conical shallow shape with two dividing ribs. These ribs delimit the cargo space at the beginning of the stern half of the logboat, which is tentatively placed in prehistory (Čepelev 1999: 47, Fig. 2a), though an Early Modern dating seems more probable. The Eastern European origin of the studied vessel form is also suggested by an oak logboat (II) from Lake Lednica in Poland, dated to shortly after 1509. This asymmetrical logboat, with a flat bottom and rounded sides, has a rib in the wider stern section, accompanied towards the stern by a low step and side grooves to support a semi-kneeling/semi-sitting paddler. The narrower front section was intended for storing fishing gear and the catch (Ossowski 2000: 65, Fig. 12).

Exceptionally good comparisons for the shape and individual elements of the studied vessel are provided by a specific type of logboat from Donja Dolina in northern Bosnia, known as a ‘čun’ or ‘čunj,’ which remained in use at the beginning of the 20th century and are described by Vejsil Čurčić in his work on traditional fishing in Bosnia and Herzegovina (Čurčić 1912: 503). These boats are up to 5m long and accommodate one, or, at most, two people. The variant with pointed ends is considered the ‘male’ type, while in the ‘female’ logboats, the ends are tongue-shaped extensions and straight-cut. A third

variant has a 'male' bow and a 'female' stern (Figure 9). These logboats generally have two ribs, which are slightly raised towards the sides and aligned obliquely with the side edges; the author suggests this was to protect the seat from splashing water. Occasionally, these boats had a slightly raised bottom in front of the last rib, where a small hearth was placed in winter. Čurčić also notes the use of similar logboats with a single rib from Hutovo Blato in Herzegovina (Čurčić 1912: 504). The tree species used for this type of monoxyl in Donja Dolina are not mentioned, but for the construction of larger, yet light and elegant, shallow-draft logboats of the 'lagja' type, poplar was used (Čurčić 1912: 502).

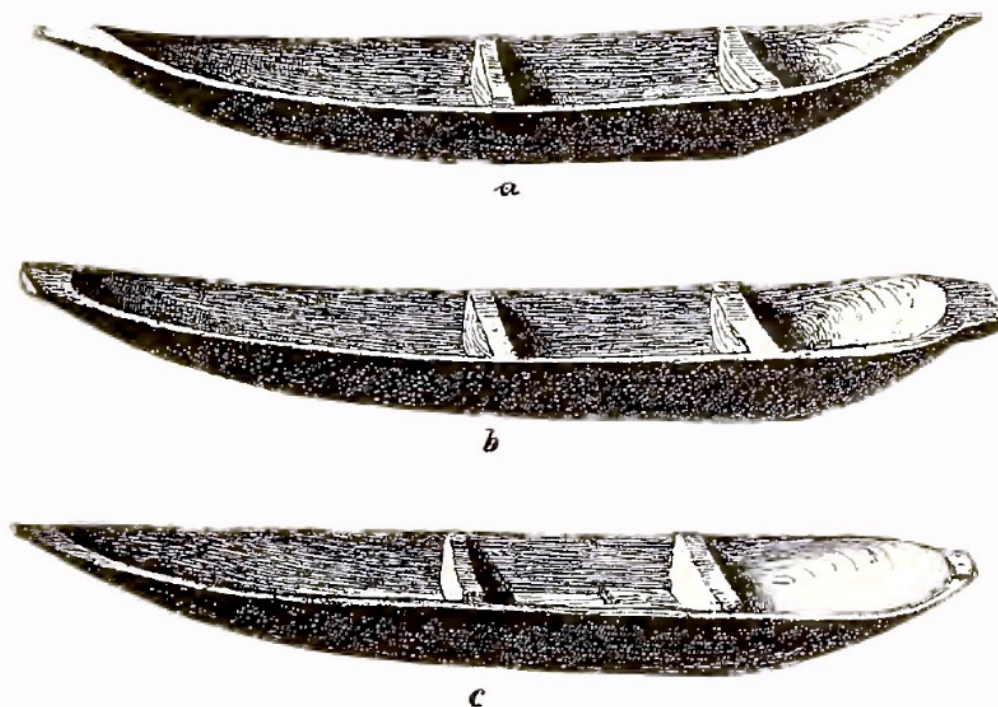


Figure 9. 'Čun' from Donja Dolina in Bosnia; a – 'male'; b – 'female'; c – front 'male,' rear 'female' (After Čurčić 1912: Fig. 11).

The presumed repair of a crack in the front part of the logboat with an iron clamp reflects a standard craft practice in Late Prehistoric, Roman, and Medieval to Early Modern shipbuilding in continental Europe. Similar iron elements in the form of narrow iron strips with rectangularly bent ends of various sizes, adapted to their purpose, were sometimes used in combination with nails both to reinforce cracks in individual components and to join parts of assembled vessels (see Erič *et al.* 2014: 204; Gaspari *et al.* 2017: 106-9; Gaspari 2023: 65-9). The tendency of logboat ends to split and require repairs is also demonstrated by such repairs to the bows of an Iron Age logboat from Zakotek near Preserje in the Ljubljana Marshes (2350 ± 130 BP; c. 800-100 BC) (Dirjec 1990: 135-6; Veranič 2016: 109-12) and a logboat from the Jankovič estate in Črna vas, probably dating to the Iron Age or Roman period (Veranič 2016: 143-5; Gaspari *et al.* 2017: 106, Fig. 97).

Conclusion

Within the corpus of archaeological logboat finds from Europe, which already exceeds 3500 (see Arnold 1995; 1996), the vessel from the bottom of Lake Bohinj near the Church of Holy Spirit belongs to the smaller category. The dimensions and shape of the logboat indicate that it was intended for transporting one to at most three people, or a proportionally reduced crew in the case of fishing or transporting a small quantity of goods or raw materials. Cargo and/or passengers were separated from the helmsman by a rib in the aft third of the logboat. The less common choice of beech wood was evidently influenced by the proximity of suitably sized trees, while greater durability and longevity of the logboat were achieved by charring the exterior surface. This feature is very rarely recorded – or absent – in European logboats, which requires caution in its interpretation before full documentation or raising of the vessel. The unique vessel has approximate dimensional parallels in logboats from Lake Bled (Gaspari *et al.* 2022: 370–5) and other lakes in the Alpine and Pre-Alpine region, where the use and construction of these simple vessels continued in some areas into the early 20th century (Arnold 1983; Pflederer 2005). The copper engraving of Bled in Valvasor's *Topographia Ducatus Carnioliae* (1678–1679) depicts a logboat very similar to the find from Lake Bohinj, with slightly raised ends, operated by a paddler wearing a characteristic fishing hat (Gaspari *et al.* 2022: 390). Among the archaeological evidence for early modern use of such vessels in the broader region, we note a 4.9m long and up to 0.6m wide oak logboat from Klopeiner (Klopinjsko) Lake in Carinthia, radiocarbon dated to 240 ± 35 BP (Stradal and Dworsky 2002: 10–1).

The age and presumed function of the vessel, as well as the location of its sinking, suggest a possible connection with supplying the local economy – perhaps as part of a duty to transport goods (Gestrin 1984: 124) – for the nearby Church of the Holy Spirit, which was assigned to one of the farms of the Bohinj unit of the Bled lordship under the Bishopric of Brixen (Gestrin 1984). According to some sources, the church's origin dates to the last quarter of the 15th century, while its current form was built in 1743–1744 (Rozman 1987; Höfler 2017: 52). Although the church and its granary could also be reached via a land route along the southern shore of the lake connecting Bohinj with the Tolmin area, and shown on the First Military Survey map (1784–1785), transport of people and goods by water was simpler and, in certain circumstances, faster.

The logboat's association with fishing is likely indicated by historical records of this economic activity in Bohinj during the Middle Ages and Early Modern period, as well as by archaeological evidence and historical depictions of similar logboat use in the wider Alpine and Pre-Alpine region (Deuchler 1981; Arnold 1995). Fishing rights in Lake Bohinj and the Sava Bohinjka were held by the Bled manor. Bohinj peasants were permitted to fish in the lake as thanks for guarding the border against the Venetians. A note in the Brixen urbarium of the Bled (Veldes) lordship from 1464 records a single tax from two and a half farms near the Church of St John the Baptist, consisting of 400 fish (*Vorhen*), most likely trout (Oitzl 2016: 307; 2018: 76–7). At the end of the 15th century, the manor prohibited the peasants from fishing, alleging they were using forbidden equipment before St Michael's Day (29 September). The peasants referred to an ancient custom under which, during the time of the Counts of Celje (Cilli) and Emperor

Frederick III, they were allowed to fish freely in the lake year-round, except for nine weeks from St. Michael's Day to St. Andrew's Day (30 November), when the manor fished in the lake and the Ribnica stream up to the weir. The Bohinj peasants ignored the prohibition, leading to repeated confiscation of their nets, baskets, and carts with fish, as well as beatings and forcible removal from the water. In 1515, the peasants appealed in vain to the Bishop of Brixen, who confirmed the founding charter stipulation that fishing rights belonged to the lords, not the peasants (Kaspret 1891: 333-5). Around the turn of the 15th century, the peasants of Bled were additionally required to carry fish-traps (Gaspari *et al.* 2021), fishpond containers, and fish crates to Bohinj for the manor's fishermen and return with the caught fish - 'something that had not been done before' (Kaspret 1891: 331).

Direct archaeological evidence for the use of logboats for fishing in the Alpine and Pre-Alpine region includes a Late Medieval logboat from Lake Chiemsee in Bavaria, discovered in 2003 at a depth of 12m. On the remains of the originally 6.45m long and 0.7-0.9m wide oak vessel, eight stone net weights were found, while vertical traces of net dragging were visible on the hull. The logboat, radiocarbon dated to between 1301 and 1408, demonstrates active fishing use (Pfleiderer 2005: 32-3).

The dimensions of the Lake Bohinj logboat, suitable for all types of passive and active fishing techniques (Gaspari *et al.* 2021), are slightly smaller than those of later composite boats with flat bottoms, raised pointed bows, and flat sterns, which are depicted on postcards and photographs of Ribčev Laz from the early 20th century, shown moored along the shore near the drying racks for fishing nets (Poštrak and Kalan 2021). An alternative interpretation of the logboat's function may be suggested by the toponym *Naklo*, which refers to a broad section of the shore and the base of the steep slopes of Mirnjak (Mirnik) (Tuma 1928: 242), west of the Church of the Holy Spirit towards Ukanc. An etymological explanation of the toponym, derived from the word *nakovalo* (anvil) (Snoj 2015), could imply, though unconfirmed, metallurgical activity. In this specific case, however, it is more likely to function as a hydronym, meaning a water-related place or landing site (Markič 1933: 210; Bezljaj 1961: 48).

The reason for the vessel's sinking at the recorded location, which places it among the deepest underwater archaeological sites in Slovenia, remains unknown. Based on current observations - particularly the damage at both ends of the logboat and the absence of ballast - it may be concluded that it was a decommissioned vessel, abandoned in shallow water, which eventually slipped into the depths after becoming fully waterlogged. This interesting find clearly deserves further investigation.

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Recent Discoveries of Deep-Sea Archaeological Wrecks in Sicily: A Valorization Hypothesis

Fabrizio Sgroi¹

Abstract

The last discovery of the two deep wrecks of *oneraria* ships containing wine amphoras Dressel 1A type constitutes a further archaeological datum for the study of the commercial sea routes in the Republican age in the ancient Mediterranean. Sicily, located in the heart of the Mediterranean Sea, has always had a strategic position in ancient maritime trade; it served as a crossroads for trade routes between Ancient Near East and West, facilitating the exchange of freight and cultures between the different civilizations of the Mediterranean. *Oneraria* ships carried a wide range of cargo, including grain, olive oil, wine, ceramics, precious metals and other local products. Maritime trade also contributed to the spread of cultural influences in Sicily: spread of ideas, religions, languages and cultural practices among the different communities that settled on the island.

The discovery of the wreckage of the German Dornier DO24 seaplane off the coast of Avola testifies to the key role of eastern Sicily during World War II as Germany's naval operational base for military operations in the Mediterranean. The enhancement of deep wrecks can certainly be implemented through the creation of deep underwater archaeological itineraries for technical divers in constant increase in the world.

Introduction

Sicily, as is widely known and documented, owes to its geographic position the fact that it played the role of crossroads of peoples, races, and ethnicities, land and sea trade, placing it at the center of ancient navigations on the routes of merchants in the Mediterranean Sea. The complex ethnic-anthropological panorama of the island, which became a Roman province after the First Punic War, and perhaps also the need to implement a structured fiscal control to replenish the Republic's coffers, impoverished by the expenses incurred during the conflict, were the prerequisites for Rome to define an institutional system for Sicily that differed from the other Roman provinces, while excluding the granting of any form of autonomy, centered around the figures of the classics *quaestores* first and those of the *praetores provincialis* later. The institution of the *lex frumentaria* (Geraci and Marcone 2004: 89) by which an annual tribute in wheat was imposed was part of Gaius Flaminius *praetor* concern for the development of small

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landowners and the class of smallholders in Sicily (Guidetti 2004: 323), which in the meantime had become Rome's granary.

The flourishing trade on the island, thanks to its favorable geographical position as a major junction of shipping routes, is undoubtedly testified by archaeological data: the trade in foodstuffs, especially oil, *garum*, and wine was carried out through the main transport container of the time: the terracotta amphora. In this chronological context found its natural place in the adoption of a type of amphora, the Dressel 1A, characterised by a stylistic form that constituted an evolution of the first terracotta transport container of Italic production better known as Greek-Italic amphora; its wide diffusion between the second half of the 2nd century BC and the first half of the 1st century BC constitutes the most important evidence of the export of agricultural production from Italy in the ancient world.

Large quantities of this type of amphoras have been found mainly in the western areas of the Mediterranean Sea, while a smaller number have been found in the eastern area; both land and sea find bear witness to this. The archaeological data in Sicily, in relation to Dressel 1A, is evidenced by the discovery of numerous wrecks of *oneraria* ships carrying this type of amphora (Olcese *et al.* 2006: 29-33). The two deep wrecks of the Republican age discovered in 2021 in Ustica and Isola Delle Femmine, documented with the joint scientific coordination by the writer, on behalf of the Soprintendenza del Mare della Regione Siciliana, and by Prof Timmy Gambin for the Archaeological Centre of the University of Malta, add to that panorama of already known wrecks that can be traced back to the chronological spectrum already highlighted, undisputed evidence of that network of trade routes that, crossing the entire Mediterranean, attributed to Sicily the role of commercial, ethnic and cultural crossroads that stretched from the western Mediterranean to the ancient Near East (Figure 1).

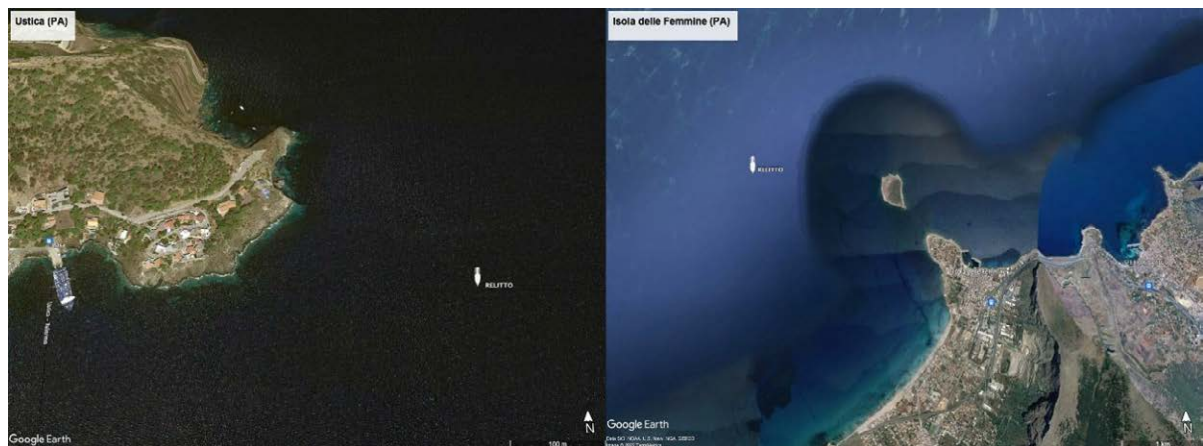


Figure 1. Left: Ustica's wreck map. Right: Isola Delle Femmine's wreck map (Elaboration by the Author, background @GoogleEarth).

The Wreck of Punta Falconiera in Ustica

The very first discovery of this wreck occurred quite by chance, during the summer of 2019, in Ustica, at Punta Falconiera, during the deposition operations on the seabed of a marble sculpture dedicated to

the archaeologist Sebastiano Tusa: a group of amphorae, some of which were partially buried, was spotted a short distance from the coast, at a depth of -87m. This discovery was the first deep water archaeological site in the sea of Ustica. In 2021 May, to better understand the nature of the site and to explore and document it, a joint scientific team between the Soprintendenza del Mare of the Dipartimento dei Beni Culturali e dell'Identità Siciliana of the Regione Siciliana and the University of Malta, with the technical and logistical support of Mare Nostrum Diving in Ustica and the Guardia di Finanza's Diving Unit, carried out documentation activities of the site, taking high-resolution photographs for the creation of a 3D model of the wreck in question and a video for the production of a documentary intended for the general television audience; at the end of the operations, diagnostic finds were recovered for the characterization and study of the materials.

The first day of operations was used to locate the exact dive site and mark it by placing a footpath on the seabed at -87m to plan the dive shifts for the team of divers, who used Rebreather units with a mixed gas diluent (oxygen/helium - ten/58) to optimize the dive time available to each of them in relation to the high lying depth of the wreck. The first dive group descended to locate the site and communicate to the surface, by DSMB (Delayed Surface Marker Buoy), the confirmation of the start of the survey and then draw a guide line from the dive point to the site to facilitate the route for the subsequent teams that would take turns diving (Gambin and Sgroi 2022: 332). The second group descended for a detailed survey to obtain a better understanding of the wreck itself, its layout on the seabed, and its peculiar characteristics; the careful examination of the archaeological material found on the seabed revealed the exclusive presence of earthenware amphorae. Subsequently, to obtain detailed documentation, some markers as metric references were placed around the pile of amphorae for the measurable 3D photogrammetric survey: acquiring accurate data at this step constitutes a fundamental aspect of the study of the wreck, or rather the primary pre-contamination documentation of the wreck itself and its context of discovery, fixing it in all its original aspects (Figure 2, left).

The second group was joined by the third group of divers equipped with cameras and high-intensity illuminators specifically to make the 3D photogrammetric survey. The operations of the second day were dedicated to video documentation activities aimed at the production of the documentary. At the end of the documentation operations, two amphorae were recovered as diagnostic elements according to the criteria of minimal typological differences of the attested containers, greater ease of recovery (the amphorae were not buried in the sediment) and minimal contamination; the objects, once they reached the surface, were taken over by the Guardia di Finanza's surface team divers who, after securing the nets and recovering the amphorae on the support boat, proceeded to transship them onto the main boat. As soon as they reached land, the two artifacts were photographed from all angles to produce high-resolution three-dimensional models of the individual artifacts. The amphorae recovered undoubtedly constitute the material with which to deepen our knowledge of this site to further the study of commercial traffic in Rome in the Republican age.

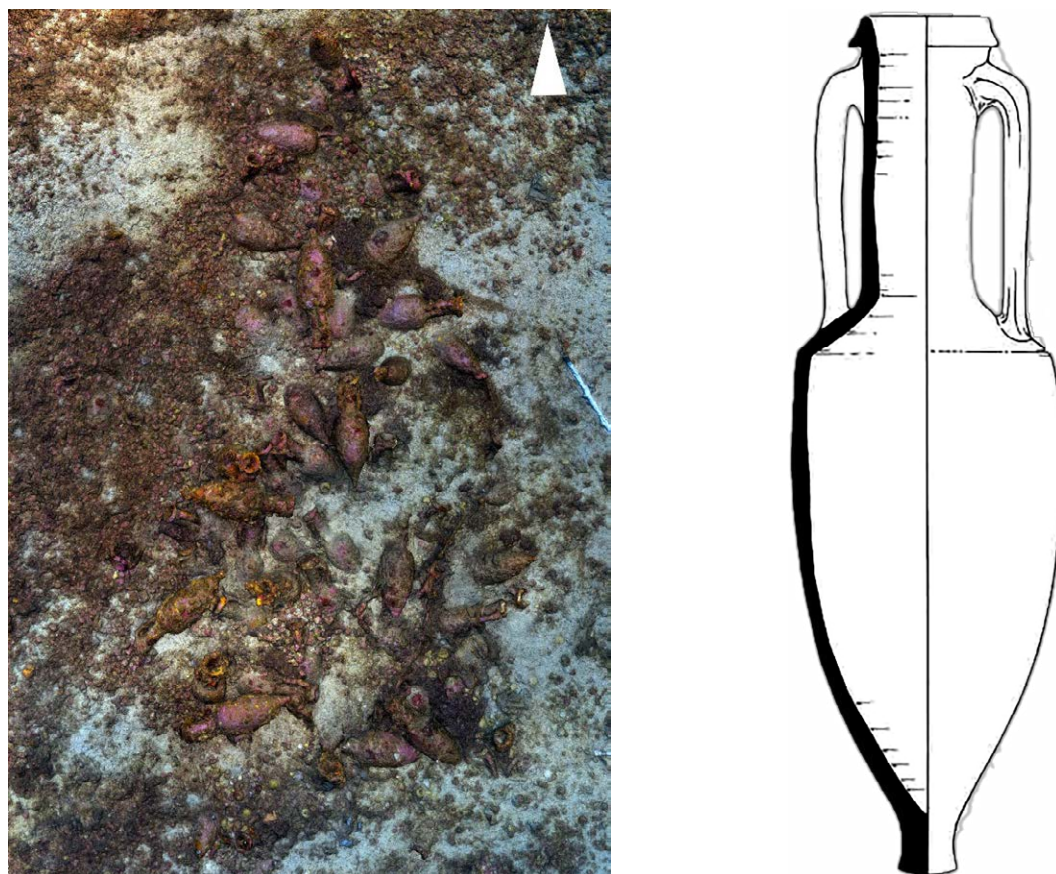


Figure 2. Left, Ustica's wreck 3d survey (Soprintendenza del Mare Archive).
Right, Dressel 1A (Drawing by the Author).

The wreck located approximately 300m from the coast near the promontory so-called 'Falconiera', at a depth of -80m and oriented on the north/south axis, appears as a heap of amphorae concentrated in an area of a few metres in diameter, while other amphorae are dispersed around this area for a radius of approximately seven metres.

The amphorae, (around fifty specimens are currently visible) appear to be variously positioned and seem to constitute the apex of a more compact underlying layer buried by the sand; although in a substantially good state of preservation, they are heavily concretized by marine animal and plant organisms and the presence of rhotolites is found, which testify to the site being subject to strong underwater currents. The seabed in the surrounding area is coarse, consisting mainly of coarse-grained sand with scattered rocks; some of the amphorae are lying on the seabed, and others only emerge from the sediment from the neck or rim: this aspect is indicative of the probable presence of further archaeological material buried beneath the sediment.

The objects, therefore, belong to a relatively common typological class, the Dressel 1A, characterised by a pronounced sloping banded rim with a well-detailed triangular cross-section; it is a type of ceramic container production that was widespread mainly in the 1st century BC for transporting wine from

ports on the Tyrrhenian coast (Figure 2, right). There are numerous finds of Dressel 1A in various parts of the western Mediterranean Sea, with particular concentrations in Spain and France; some examples have also been found in Germany and Great Britain.

Some considerations regarding the context: Ustica, despite having no usable harbours or anchorages in antiquity, shows traces of frequentation from at least 1400 BC. Excavations in the 1970s at Tramontana place brought to light the remains of a fortified village with at least three hundred houses (Spatafora 2009: 508). Ustica was probably founded by populations that transited from the nearby Aeolian Islands; in Roman times, archaeological remains consisting of coins, mosaics and ceramics indicate some form of settlement with the nearby necropolis. Evidence of frequentation of this site suggests that it occurred with varying degrees of intensity from around the 3rd century BC to the 6th century AD (Spatafora 2009: 513), while coins and mosaics found here reflect a degree of economic prosperity of its inhabitants. During antiquity, the island witnessed maritime activities and trade with other areas of the central Mediterranean and beyond; evidence of this can be found in the numerous archaeological finds unearthed in the seabed of Ustica in recent decades, which highlight the island's maritime connections to the center of the Mediterranean.

The recovered objects range from ancient stone anchors to Punic amphorae and from lead logs to late Roman amphorae. These remains provide a clear indication of the island's function in antiquity: as part of an extensive Aeolian archipelago, Ustica was part of the maritime landscape of northern Sicily. The island would have been used as a landmark for ships sailing both east and west. It would also have offered temporary shelter for ships caught in the wind and rough seas. It would also have provided a suitable landing place for ships to plan the continuation of their voyage while waiting for favorable winds. To date, underwater archaeology in Ustica has been rather sporadic, with a focus on shallow waters, down to bathymetries not exceeding -50m; this is understandable due to the limitations of divers using standard SCUBA equipment. Given the presence of archaeological deposits in waters down to -50m, it is not unreasonable to assume that further archaeological deposits lie beyond -50m.

The presence of an underwater archaeological itinerary consisting of several anchors from various eras, created by the Soprintendenza del Mare in 2006 at Punta Falconiera place, at about -30m, right near the wreck in question, confirms the site's function as a landing place or temporary shelter already in Punic and Roman times: the presence of the remains of dwellings and necropolis dating from the 3rd century BC to the 1st century AD indicate an almost uninterrupted human presence in this broad spectrum of time (Purpura 2009: 61), while the discovery years ago of some Dressel 1A amphorae in the Cala Camposanto locality (Purpura 2009: 58) further confirms the above-mentioned findings regarding Ustica's role as the bridgehead of northern Sicily in Rome's naval trade in the Republican age between the shores of the Tyrrhenian Sea and northern Africa, starting from the second Roman-Carthaginian treaty (Maras 2007: 408).

The Wreck of Isola delle Femmine (PA)

The second wreck found is set in a geographical context characterised by the presence of the islet, with the remains of an ancient tower at its northern end, just a few tens of metres from the coast of the municipality of Isola delle Femmine, in the western province of Palermo. On the islet, there are also the remains of tanks used for the production of *garum* in Roman times, which in some ways testify its use since ancient times, thanks to its geographical position along the western coast of Sicily, located in a stretch of sea affected by the millennial tuna routes in the Mediterranean (La Rocca and Bazzano 2017: 160). Despite its deep waters, with the seabed on the north side of the island dropping to a depth of minus 100m at about 900m from the coast, this islet was once somewhat of a danger to navigation and probably also an ideal place for ambushes offshore, as evidenced by the presence of wreck of the merchant ship Loreto, sunk by a British submarine during the Second World War period.

In the summer of 2021, during an environmental survey by A.R.P.A. Sicily (Regional Environmental Agency) Sicily, researchers came across the remains of a cargo of amphorae, some of which were partially buried, lying at a depth of about -85m. Similarly to what had happened months earlier for the Ustica wreck, in November of the same year another research and documentation project involved this wreck of Isola Delle Femmine, involving an international research team made up of the Soprintendenza del Mare, the University of Malta's Archaeology Centre, A.R.P.A. Sicily, the Coast Guard of Palermo with its Diving Unit, the Saracen Diving Centre of Isola Delle Femmine and Mare Nostrum Diving of Ustica (Bucci 2022: 2779). The operations lasted a couple of days according to the usual program of surveying and documenting the site with high-resolution photographs for the creation of a 3D model of the wreck, making a video for the production of a short documentary intended for the general television audience, and the final recovery of diagnostic findings for the study of the site (Gambin and Sgroi 2022: 334). Scuba diving was conducted using rebreather units containing an oxygen/helium mixture of ten/58 depending on the high depth of the wreck, with the aid of the ROV supplied by the ARPA boat, following the same program already successfully adopted during the previous mission on the Ustica wreck. The wreck lies a few hundred metres from the islet of Isola Delle Femmine, at a depth of -87m on a rather muddy seabed characterised by coarse-grained sand with scattered stones, at the foot of an escarpment more than two metres high and with a north/west-southeast orientation: most of the amphorae are partially visible because they are outcropping from the seabed (this indicates the probable presence of the remaining part of the wreck in the area below the sediment) and on one side of it one can perceive the marks left by the sinking of the vessel that carried them (Figure 3). At the end of the documentation operations, an amphora and a fragment of another were recovered as diagnostic elements according to the same criteria adopted in the recovery of the Ustica wreck. Subsequently, on land, the amphora was photographed to produce a high-resolution 3D model of the artefact.

These two campaigns in 2021 on the deep wrecks of the Roman age of Ustica and Isola Delle Femmine were a success from all points of view, especially in terms of safety: although the objectives appeared rather ambitious, the teamwork and collaboration between the various institutions and associations that took part in the research projects ensured the final success. Considering that both wrecks offer us

a rather common type of amphorae, based on the large number of findings over time throughout the Mediterranean Sea, including Sicily, and since they lie at a considerable depth, it was decided not to proceed with a systematic excavation, which would impose a considerable economic commitment, since these sites would offer the perfect opportunity to create a cultural tourism attraction in the future for deep-sea divers, the new frontier of underwater tourism, in line with the line already adopted by the Soprintendenza del Mare for Sicily's underwater cultural itineraries and in line with the 2001 UNESCO Convention on Underwater Cultural Heritage. Regard to the context of reference, it is emphasised that the systematic underwater and terrestrial reconnaissance of recent years in the area of Isola delle Femmine has allowed for the recovery of a considerable number of diagnostic ceramic materials referable to a very broad chronological spectrum that ranges from the Hellenistic-Roman age to the Middle Ages and post-medieval period (La Rocca and Bazzano 2017: 167); these include the discovery of fragments of amphorae of the Dressel 1A type (La Rocca and Bazzano 2017: 169), which, together with another amphora of the same type left in its original location and forming part of one of the two underwater archaeological itineraries present at Isola Delle Femmine, undoubtedly certifies the frequentation of this site as early as the Republican age (Bucci 2022: 2788).



Figure 3. Isola Delle Femmine's wreck relief (Soprintendenza del Mare Archive).

The archaeological data from the study of these two wrecks is part of the broader context of large quantities of heterogeneous goods that in relation to the multiple land and sea trade routes characterised the Roman world. According to a consolidated characteristic of archaeology, the study of naval wrecks of *oneraria* vessels, this discovery enriches those distribution maps of artefacts found over time that help us reconstruct routes, production centers, landings, and centers of ethnic and cultural contact in the ancient Mediterranean basin. Hodder in the 1970s was one of the first scholars to propose a more systematic approach to the scientific study of distribution maps of archaeological materials through the creation of graphs, highlighting for a normal distribution the form of a halo, radiating in all directions from the point of origin, namely from the point of manufacture or sale, with the density of finds decreasing steadily as the distance from the center increases, while an anomalous distribution could be interpreted based on goods presumably loaded on board starting from a production center and arriving at the emporia after a long journey (Parker 2008: 177). By the analysis of this study, it appears that there is no stereotypical limit distance beyond which it was not economical to transport goods by sea, but that the circumstances of topography, supply or demand would on some occasions have made it worthwhile to send such goods by sea over even very long distances; it is easy to see how the infrastructure of maritime trade in place and sufficiently developed already in the Principality, responded to commercial needs as they arose. As far as the archaeological method is concerned, the land distribution maps of traded goods potentially reveal the use of sea transport but do not indicate the routes followed by the ships: to reconstruct ancient maritime routes, one must therefore turn to the study of wrecks, the stowage characteristics of which undoubtedly constitute a more comprehensive source of information (Parker 2008: 187).

Ancient cargo ships sank along their route in a wide variety of circumstances, but shipwreck sites being, in most cases, the result of sudden and spontaneous events, they cannot therefore be understood as a suitable indicator for estimating the number of ships that sailed along that particular route; the position of each wreck therefore represents an interrupted voyage along its route and the distribution map of wrecks can certainly correspond to the directions in which ships sailed in antiquity. It must be acknowledged, however, that some vessels may have been pushed away from their intended route, and thus no single wreck site could be considered certain evidence of a route, but as a generalizing tendency it can certainly be taken into account within a wreck map for a reconstructive hypothesis of trade routes traveled. In this regard, historians have proposed two basic models of maritime trade: the so-called tramping, the direct trade through emporia, which, regardless of whether ships sailed inshore or offshore from the mainland, addresses the issue from the perspective of the scale of trade, the level of foresight and planning in relation to the composition of the cargo and the degree of information available on markets, and the so-called Brownian movement, namely an irregular or random movement of cabotage and periodic rural markets that characterised the mediterranean region at that time (Rice 2016: 165).

Considering that Dressel 1A wine amphorae were widely exported from central Italy in the 2nd and 1st centuries BC, the analysis of this map shows how these goods were transported over long distances and, knowing the origin of these shipwrecked cargoes, we can analyze their spread in terms of the

geographical areas involved in their trade, which can provide us with a distribution pattern characterised by the fact that, for example, one in five of the known Dressel 1A wrecks is located in the Tyrrhenian Sea, within a few miles of their probable port of departure, but twice as many wrecks have been found at considerably greater distances (Parker 2008: 194).

The Wreck of the German Seaplane at Avola

As part of some exploration and historical documentation dives realized along the Syracuse coastline by the Superintendence of the Sea in collaboration with the Capo Murro Diving Centre, a German seaplane type Dornier DO24 was found and documented. The wreck is located off the coast of Avola (Syracuse) at a distance of about three miles from the coast, at a depth of -122m; the seaplane is lying on the mud in flight trim with the nacelle protruding from the bottom for about two metres, missing the tail section (Figure 4, left). An initial observation did not reveal the presence of weapons or ammunition except for a machine gun positioned in the bow gunner's quarters (Figure 4, right). On the basis of archive research by Fabio Portella, Honorary Inspector for the Underwater Cultural Heritage of Syracuse, the wreck is said to be traceable to the accident that occurred on 29 December 1942 to a Dornier DO24 that took off from the Syracuse seaplane base and crashed soon afterwards due to a failure during take-off. It was precisely at the Aretusean seaplane base where the 6th Seenotdienst Wing was stationed (from March 1941 to May 1943), a Luftwaffe unit whose task was to rescue in the water aviators shot down by emergency landings, made up of a squadron of German seaplanes, including Dornier DO24. Five aviators perished in the accident, the NCOs Heinz Hassler, Wilhelm Ritzrau, Ernst Villnow, and the corporals Ernst Jedermann and Georg Schweizer (Marcon 1992: 142); the corpses of the aviators were recovered, and their bones lie under tombstone number 14 at the German War Cemetery in Motta Sant'Anastasia (Catania).

The Dornier DO24 has three-engine, all-metal, center-hull, high-wing seaplane designed by the German company Dornier Flugzeugwerke for maritime patrol, search and rescue at sea (King 1939: 372), of which 279 were produced between 1937 and 1945 by Dornier and other aircraft companies (Green and Swanborough 1983: 10). The aircraft was characterised by its length of 22.5m, height of 5.53m, a wingspan of 27.30m, and dry weight of 9,5 tons. Powered by three BMW - Bramo 323R-2 radial engines of 735.7kW each, it could reach a maximum speed of 332km/h at an altitude of two thousand six hundred metres (Green 2010: 242).

During the Second World War, with the German occupation of the Netherlands and France, and consequently after the capture of Aviolanda's complete and intact production line at Papendrecht and the successful testing of DO-24N models with the Seenotdienst, the Luftwaffe decided to continue production and adapt the seaplane exclusively to the specific task of maritime rescue. Formally then, the DO24 description disappeared and was replaced by the Wehrmacht Gerät code '8-024' in which the number 'eight' was the German code used for seaplane. The management and supervision of production in the Netherlands was managed by Weser Flugzeugwerke in Eindhoven. For the new version of these

seaplanes intended for the rescue of shipwrecked people, the designation DO24T was used; two large hatches were made in the fuselage, which was entirely modified for this purpose. In addition, the seaplane was fitted with defense armament: the 'A' and 'C-Stand' (front and rear positions) with a 7.9mm MG15 machine gun in an Alkan turret. The 'B-Stand' (center position) was equipped (like the Dutch version) with a Hispano AB15 turret with an HS404 20mm cannon. Production of the new DO24T-1 began in December 1940 and the Aviolanda plant, according to the German military leadership, to increase production of the model, was to be used only for final assembly (De Jong 2015: 10-11). Production of the wings and assembly of the engine was the work of De Schelde in Vlissingen; the De Schelde factory, on the Kilkade in Dordrecht, was used for the production of the complete fuselage, in which all elements were henceforth coded with a number: the fuselage was 'one', the stumps 'two', the rudders 'three', the steering 'four', the wings 'five', the engine mounts 'seven', the fuel tanks 'seven', the electrical system 'eight' and the non-electrical systems 'nine' (Born 1996: 8).



Figure 4. The Dornier DO24: left, detail of the cockpit above, the watchtower below; right, view of the right wing above, view of one of the engines below (Soprintendenza del Mare Archive).

As part of the cooperation of several factories in the production of these seaplanes, groups of numbers emerged, referred to as 'Sach Nr': for example, the tail surfaces had Sach Nr. '8-24-354', followed by a four-digit Werk Nr (construction number) in which the first digit of the construction number of the elements and the complete seaplane was the factory code. The code 'one' was for Dornier, 'two' was not used, 'three' Aviolanda, 'four' SNCA-N, 'five' Fokker and another 'four' was the wing construction at De Schelde. The different manufacturers (Herstellere) were given a numerical code by the RLM office in Baarn: for example, Aviolanda was 'mfc', De Schelde was 'mfb', Verheul in Gouda was 'kew.' After a bombing raid on 20 August 1943 by the Dutch 320 Squadron with North American B-25C Mitchell bombers, wing production was moved from Vlissingen to Dordrecht. The construction of other seaplane

components took place at two factories in Zwijndrecht (Werk Zwijndrecht I and II), the I.G.B. shipyard and the Kwatta chocolate factory in Breda, a factory in Zevenhoven, Verheul in Gouda, the Eternit factory in Goor and the Holland-Nautic factory in Papendrecht en Haarlem. Pre-assembly was carried out at the Lips factory in Dordrecht (Aviolanda II), in Papandrecht (Aviolanda III) and in Slikkerveer.

For the distribution of Dornier licenses, a Verbindungsstelle Niederlande (DWH/ZT) was set up in a large villa right next to the Aviolanda factory. This department, under the command of Otto Stellmann and his deputy Ingenieur Siegert, received their orders from the Dutch section of the RLM, department GL/C in Baarn, and the Dornier-Werke Friedrichshafen (DWF) ZT 201/4. The department ZT201/4 (Gruppe four der Nachbauabteilung Zentraler Technischer Bereich) managed all affairs relating to project '8-024' and was under the command of Ingenieur Wilhelm Griesel and Dipl Ingenieur Hans Kinzler. Due to the expansion of the front lines, particularly around the Mediterranean and Black Sea, and the heavy losses of the DO24, the Seenotbereichskommando required a higher production rate: Aviolanda came to produce at its maximum rate of one aircraft per week. To expand production, it was decided to involve Fokker in Amsterdam and SNCA-N. in the French town of Satrouville (near Paris) in Dornier production. With the end of the war after Germany's surrender in 1945, the victors divided up the remaining intact DO24 Dorniers: Soviet Union used one of them as documented by a 1948 photograph in Siberia, which shows it stripped of all its armament and the aircraft's final fate is unknown. Norway took possession of two DO24s, these were Werk Nummern 3300 and 3335, but due to a lack of spare parts, they were sunk in February 1946 near Horten.

Conclusion

For the wrecks described in this article, lying in deep waters, some considerations arise regarding their protection and valorization. While for the archaeological wrecks of the Roman period we are certainly in the presence of ceramic material of a rather common type, based on the numerous finds that have occurred over time throughout the Mediterranean, and with some probability of organic material under the blanket of sediment (the wood of the hull), for the German Dornier seaplane the problem of the corrosion of the metal of which it is composed raises some questions about possible hypotheses for *in situ* conservation actions. Considering, therefore, that systematic excavation for the recovery of these wrecks, which would impose a considerable economic commitment, one could alternatively consider the hypothesis of valorizing them by transforming them into a cultural tourist attraction open to deep-sea divers, the new frontier of underwater tourism, by including them in a network of deep-sea wrecks that would expand Sicily's cultural tourist offer.

Starting from the legal principle, enshrined in the 2001 UNESCO Convention on Underwater Cultural Heritage, according to which the *in situ* conservation of underwater cultural heritage is to be considered as the priority protection option, to be implemented with the aim of encouraging responsible and inoffensive public access to the underwater cultural heritage, in order to promote public awareness of this heritage, as well as its valorization and protection, the enjoyment of underwater cultural sites in

deep waters can certainly be achieved through the latest technologies related to the world of virtual reality and augmented reality; through the documentation of sites by means of digital acquisition (images, video, photogrammetry, etc.) and the development of a three-dimensional modelling and rendering system. Through the documentation of sites by means of digital acquisition (images, videos, photogrammetry, etc.) and the development of a three-dimensional modelling and rendering system, it is now possible to realize virtual tours that could be networked using an exploratory portal, specifically designed and created for the enjoyment of these cultural attractions, with experiences based on virtual reconstructions and innovative storytelling paths (Gambin *et al.* 2021: 3367-3368).

The final objective, therefore, through scientific research, is to translate the results obtained from the archaeological campaigns carried out on individual sites into a project for the protection, valorization and musealization in situ that can satisfy not only scientific needs but also those of cultural tourism by making these deep wrecks accessible to the world of technical diving (over -50m), the number of which is rapidly expanding worldwide due to the development of diving technologies (rebreathers).

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Underwater Archaeology and Nautical Technology

Medical Consultancy in the Archeological Diving Project of the Antalya-Kumluca Bronze Age Shipwreck (2022)

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Abstract

A Bronze Age Shipwreck was found in Kumluca-Antalya in 2018. Large-scale excavation works on the wreck were carried out in 2022. Diving was performed from the ships named Arkeo and Virazon II. A multi-place pressure chamber was placed in the ship in case of the treatment of decompression sickness. There were 16 men and 13 women participants who carried out a total of 1297 dives. The average depth of total dives was 39.81.6±19 metres, with a maximum of 72.3 metres. Three medical doctors who specialise in underwater and hyperbaric medicine worked on the boat with a 10-day rotation during the two-month working period.

Medical consultancy in the field had the following objectives: to carry out preventive medicine to be taken against diseases, accidents and events related to diving or other causes. Our results show that there were no significant health problems during the study period, and no decompression sickness was observed. Bubbles were detected by hand Doppler only after eight dives and in only one diver. Repeated measurements of pulmonary function were performed at the beginning, middle and end of the study. It was found that there were only significant changes in slow vital capacity (SVC) values in function parameters ($P=0.016$). There was no significant change in other pulmonary function test parameters ($p>0.05$). As a result, the presence of a pressure chamber and diving medical physicians and consultants at the diving site is extremely important in terms of safety in these relatively deep dives.

Introduction

The Shipwreck

The Bronze Age Shipwreck in Antalya-Kumluca was discovered in 2018. The typology of the copper ingots which constitute the load of the vessel let us to date it to the 16th-15th century BC. Currently only five of those copper ingots are displayed in a limited number of museums (Figure 1). The wreck

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area starts at 38 metres depth spreading to 52 metres on a 45-degree slope. No other wreck material could be found until 90 metres from that point on, because of the sandy bottom (Öniz 2019).

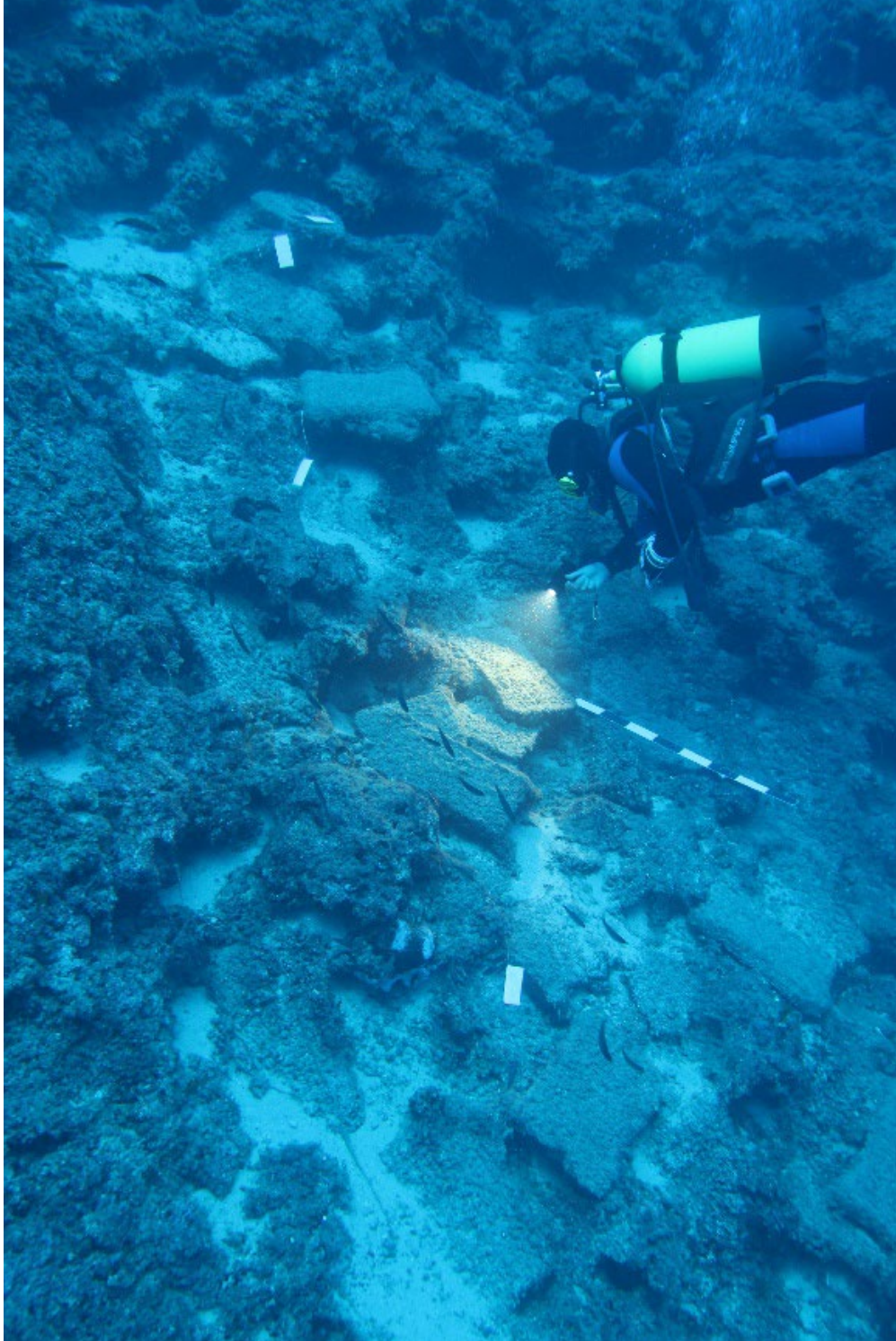


Figure 1. Copper ingots from Kumluca Bronze Age Shipwreck.

The wreck, which dates to the 16th-15th century BC, is understood to be the oldest merchant shipwreck discovered so far in the world. The previous oldest shipwrecks had also been discovered in Antalya province. The Gelidonya shipwreck which began to be excavated in 1960 dates to the 12th century BC. The discipline of underwater archeology was founded on the studies performed by George Bass on this shipwreck. The Kaş-Uluburun shipwreck was dated to two centuries earlier than the Gelidonya one. The excavation work of this late bronze age shipwreck which dated to 4th century BC (1320±15 BC) was led by George Bass and Cemal Pulak between 1984 and 1994. As such, the Kumluca shipwreck is two centuries older than the Kaş-Uluburun shipwreck (Öniz 2019). The excavation works were launched in 2019 by Akdeniz University, Faculty of Fine Arts, Department of Protection and Repair of Cultural Heritage, Department of Protection of Underwater Cultural Heritage with the approval of the Ministry of Culture and Tourism. The excavation was suspended during 2020 and 2021 due to COVID-19 pandemics and restarted on June 15th in 2022, continuing for 2 months until August 2022. This important excavation is now under the 'Auspice of the President' with the decision of the Presidency.

The Teams and the Dives

During 2022, the dives were performed from the ship *Arkeo*, which belongs to Akdeniz University, and the ship *Virazon II*, which belongs to the Institute of Nautical Archeology (INA). As the hyperbaric chamber of *Arkeo* had been moved to the newly constructed ship, the multiplace hyperbaric chamber on *Virazon II* was used for the dives. Excluding the days when no dives could be made because of extreme weather conditions or technical reasons, dives were made on 49 days. Excluding dives for observation and investigation, in total 1297 dives were made by 29 researchers directly for excavation purposes. Sixteen diving researchers were male and the remaining 13 were female. According to the records, their age average was 40.3±13.3 years, their height average was 170.9±7.8cm and their average body weight was 75.0±15.5kg. The total underwater time elapsed during the dives was 51,600 minutes (35 days, 20 hours). The average dive time was 39.91±10.24 minutes. The average diving depth was 39.81±6.19 metres with a maximum depth up to 72.3 metres.

All dives were performed with air except one performed to 72.3 metres with Trimix to search the areas around the shipwreck. Except for some dives made for the purpose of connecting vaults, releasing chains, photographing the surrounding area etc., all the dives made for the works on the shipwreck were made following the same rules. Whatever the depth of work of the divers, the time at depth was determined as 20 minutes. There was a sound alarm system that warned the divers underwater at the 18th and 20th minutes of the time at depth. The divers who ascended to 6m to any of the ships at a speed of 10m per minute switched to oxygen-breathing through regulators interconnected with a collector. At times depending on the diving depth and whether the dive was the first or second dive of the diver, an oxygen decompression procedure was applied.

Full diving tanks connected to a regulator were kept handy at different areas around the shipwreck for emergency cases. Again, a communication booth was placed at 35m depth. In this booth, divers could

talk with each other or with the crew of the ship. During all dives, a Remotely Operated Vehicle (ROV) was used to view the entire work area. The image provided by this ROV was monitored and recorded by the crew on the ship *Arkeo*. The divers removed their fins when they reached the shipwreck and worked on the materials without wearing fins.

The dives at the shipwreck area had various purposes like observing, photographing, drawing, photo scanning, removing sand and stones to reveal the artefacts, pulling off the copper ingots and cleaning them, and removing the ingots with the help of a hammer and chisel and lifting balloons etc.

Material and Method

The medical consultancy on the site had the following purposes:

- To provide a preventive medical service by determining the measures to be taken against diving-related and other illnesses, accidents, and injuries
- To intervene promptly in case of a decompression sickness, a gas embolism, a barotrauma or any other illness related to diving
- To intervene in case of any non-diving related accident, injury, or illness
- To check bubbles in blood stream using the Doppler ultrasound method for evaluating the diving tables
- To evaluate the possible impacts of oxygen decompression with a respiratory function test

To that end, three diving and hyperbaric physicians worked during the two-month period with a 10-day rotation schedule. No dive was made without a diving physician onboard. All health issues encountered during this period of work have been recorded. For the Doppler ultrasound records, we used the Dopplex II handheld doppler model of the company Huntleigh Healthcare, with a 5 MHz probe installed. The measurements were made in a manner that allows us to listen to the pulmonary artery from the precordial area and the subclavian vein under the right clavicle. The measurements started within at most 15 minutes after the return of the divers to the surface. In cases where no bubble was detected, we repeated the measurements after 30, 60 and 120 minutes. In cases where bubbles were detected, we took measurements every 15 minutes until the bubbles completely disappeared (Spencer and Johanson 1974; Møllerlækken *et al.* 2016). These sounds were recorded with a digital voice recorder.

For the respiratory function test, the SP-1 model spirometer of Shiller brand (Baar, Switzerland) was used. The device was calibrated before every measurement. For assessing the ‘volume’ parameters of the respiratory function test, the parameters SVC (slow vital capacity), FVC (forced vital capacity), FEV₁ (forced expiratory volume at first second) and FEV₁/FVC have been measured. To evaluate the ‘flow’ property of respiratory functions, the parameters PEF (Peak Expiratory Flow), FEF₂₅, FEF₅₀, FEF₇₅ and FEF₂₅₋₇₅ (Forced Expiratory Flow medium flow – 25-75%) have been used. The respiratory function test

was performed three times for each diver; at the beginning, in the middle and at the end of the work period. Respiratory function tests could be made with 13 divers. Initial measurements of two divers, mid work measurement of two divers and final measurements of three divers could not be taken due to delayed participation or their leaving early.

Findings

No decompression illness was observed during the dives. We observed two cases of injury with lionfish stings, two cases of injury with jellyfish strings, two cases of allergic dermatitis due to jellyfish larvae, one case of minor physical trauma and four cases of ear and sinus barotrauma. We observed three cases of upper respiratory infection in the form of rhinitis and sinusitis. These cases were not tested for COVID-19. For eight cases on *Virazon II* where patients had complaints of fever, weakness, headache and coughs, the first COVID-19 tests were negative, but the later tests proved to be positive.

1st DIVE					2nd DIVE				
15 min	30 min	60 min	120 min	Dive	15 min	30 min	60 min	120 min	Dive
Ø	Ø	Ø	Ø	40.9 m/41 min /8 min deco	Ø	Ø	Ø	Ø	44.9 m/35 min /8 min deco
+	+	+	+	39 m/39 min /5 min deco	+	+	+	Ø	44 m/42 min /15 min deco
No measurement				32.9 m/29 min /3 min deco	Ø	Ø	Ø	Ø	38.7 m/18 min /3 min deco
+	+	+	Ø	39.8 m/31 min /5 min deco	No measurement				39.8 m/44 min /15 min deco
Ø	+	+	Ø	39.8 m/30 min /5 min deco	No dive				
Ø	Ø	Ø	Ø	40.1 m/48 min /15 min deco	+	+	Ø	Ø	40.6 m/57 min /23 min deco
Ø	Ø	Ø	Ø	39.8 m/32 min /5 min deco	Ø	Ø	Ø	Ø	39.8 m/39 min /22 min deco
+	Ø	Ø	Ø	40 m/31 min /5 min deco	Ø	Ø	Ø	Ø	40 m/41 min /15 min deco
No dive					Ø	Ø	Ø	Ø	41 m/46 min /19 min deco
+	+	Ø	Ø	40 m/32 min /5 min deco	+	+	+	+	40 m/46 min /15 min deco
Ø	Ø	Ø	Ø	40 m/32 min /5 min deco	No dive				
Ø	Ø	Ø	Ø	39.9 m/33 min /5 min deco	No measurement				40 m/42 min /16 min deco

Table 1. The diving properties of the diver whose blood had bubbles after dives and the measurement times of the detected bubbles.

Doppler Bubble Measurements

Bubble measurements were taken with the handheld doppler device on 13 divers who dove from the ship *Arkeo* after 93 dives and their sounds were recorded. Bubbles were detected after eight dives. The dives after which bubbles were detected had all been made by a single diver. This diver made 18 dives which could be evaluated by doppler ultrasound in total and in eight of them bubbles were detected. No bubble has been detected in other divers, except for a few suspicious measurements. The diving properties of the diver whose blood had bubbles after dives are shown in Table 1.

Respiratory Function Test Measurements

After the repeated measurements made at the beginning, in the middle and at the end of the studies, we have found a significant change only in Slow Vital Capacity (SVC) values among the respiratory function parameters ($P=0.016$). The average vital capacity, which was 4.86 ± 1.12 litres in the first measurement decreased to 4.36 ± 1.38 litres. The average decrease in SVC was found as 0.49 litres and the decrease rate was 10.1%. No significant change was observed in the other respiratory function parameters ($p>0.05$). We found a positive correlation only between the decrease in SVC values and the Total Number of Dives parameter (Spearman $p=0,040$ $r=0,731$). No correlation was detected between the total diving time, mean diving time, total oxygen decompression time, mean oxygen decompression time and the mean diving depth, and the decrease of the SVC values.

Discussion

We didn't encounter any significant medical conditions during the period of study. We observed a significant proliferation of biological life in the environment due to the hammer and chisel activities in the work area. The number of lionfish - a Lessepsian invasive species - increased day by day. The risk of injury by skin contact with lionfish increased as the result of not using fins in the work area. The injuries caused by lionfish, which is a very mobile fish, mostly resulted from incidental touch unlike the injuries caused by other venomous fishes like weever or scorpionfish where injuries mainly arise from stepping on them. As a result those injuries didn't require any significant medical intervention. For lionfish injuries, it was recommended not to wear shorts and short-sleeved diving suits and it was required to wear boots. After the implementation of these measures no further lionfish injury was observed.

Although the work area was relatively deep and the time at depth was as long as 20 minutes, we saw that the oxygen decompression table that we used was very safe. We haven't seen any decompression sickness after 1297 dives. We could take Doppler measurements only in 93 dives (7,17%) and we haven't detected any bubbles, except in one diver. It is not practically possible to make Doppler measurements in the ship for each diver after each dive. It is very interesting that only one diver had bubbles. The difference between individuals with respect to bubble formation draws more and more attention (Gottschalk *et al.* 2022). When we analyze the characteristic features of diving, we see that bubbles can

appear irrespective of the depth, time or whether it is the first or second dive. We couldn't detect bubbles in the pulmonary artery, but we could monitor them in the right subclavian vein. We asked the diver in question, who worked with hammer and chisel undersea, to use the left hand instead of the right one. There is nothing special in the right extremity of this diver. We did not detect any bubbles in the measurements taken after the dives, and the diver was asked to have a break for recreation. We plan to examine this diver physically and genetically in more detail.

The decompression stop with oxygen is a safe procedure with respect to decompression sickness but applying oxygen decompression for two months can cause pulmonary oxygen toxicity. For that purpose, we did a respiratory function test at the beginning, in the middle and at the end of the diving period, but only with a limited number of subjects as some divers joined the team after the project started or left the team earlier than the project end. So, the number of tested divers is as low as eight. However, we noticed that the SVC value significantly decreased in these eight subjects at the end of the work period. This decrease reached 10%, which is an acceptable upper limit in pulmonary oxygen toxicity. In the correlation analysis made with this limited number of subjects, we could identify a correlation only with the number of dives. We couldn't find any correlation with the total time of oxygen decompression. Again, this outcome supports our opinion that the respiratory function values of the divers should be followed up in the coming years too.

Conclusion

Considering that this excavation, which is very important for underwater archeology, will continue in the coming years, it is very important to have a decompression chamber and a doctor who is specialised in underwater and hyperbaric medicine at the diving site to ensure safety in these relatively deep dives. We also deem it necessary to continue Doppler measurements and respiratory function tests in the coming years.

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Reassessing Polybius' Account of the Battle of Aegates (241 BC) Using Underwater Material Culture

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Abstract

Polybius wrote that the Roman Republic had no warships at the start of the First Punic War. Faced with fighting a veteran maritime power, the Romans were compelled to build their own navy and inexperienced Roman shipwrights copied Carthaginian designs. These warships, quinqueremes, were galleys, each armed with a piercing bronze ram. They were, in essence, a human-powered ship-to-ship projectile. The decisive naval action which concluded the war was the Battle of the Aegates (241 BC). Here the Romans defeated the Carthaginians, attempting to resupply their besieged soldiers in Sicily.

In 2004 an illegally trafficked ram was confiscated by the authorities. This event led to a systematic archaeological survey off the Egadi Islands, Northwest Sicily, by RPM Nautical Foundation and the Soprintendenza del Mare, Regione Siciliana. Their methodology was fruitful, and twenty-five more rams have been found, a unique archaeological discovery of an ancient naval battlefield site. Prior to 2004 only three rams were known and were extremely rare.

The Roman and Carthaginian rams are similar in size and design and are from warships smaller than quinqueremes. This paper will assess the rams' contribution to our knowledge of warship design and tactics and whether Polybius exaggerated the size of the warships.

Introduction

The ancient Greek historian Polybius wrote his 'Histories' after 146 BC (after the conclusion of the Third Punic War). He is the best surviving authority on the First Punic War (264 BC to 241 BC) and his work is generally well respected (Murray 2019: 36). This war was pivotal to the course of ancient history, as the naval lessons learned by the Romans in the war made future conquest of the Hellenistic kingdoms possible (Goldsworthy 2000: 96). Thus, the importance of the Republic's 'momentous decision to challenge the Carthaginians at sea' (De Souza 2015: 188) cannot be underestimated.

This paper will assess Polybius' account of the Battle of the Aegates (241 BC) using the underwater material culture from the Egadi Islands, found due to the brilliant vision of the late Sebastiano Tusa. This site is the only known example of an ancient naval battlefield found to date.

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This paper challenges statements made by Polybius, in particular, that the battle was between quinqueremes (Figure 1). These were oared galleys with a crew of three hundred rowers, armed with a bronze ram and carrying a complement of marines. However, the rams found at Egadi are too small to be fitted to quinqueremes, and it has been proposed that they belong to triremes. This paper proposes that the rams may have belonged to smaller, auxiliary craft, known as *lemboi*.



Figure 1. Photograph of a Roman Republic Aes Grave, showing the prow of a Roman warship, possibly fitted with a 'corvus'. Dated circa 225-217 BC (Photo British Museum, Museum No. 1867,0212.74).

Polybius' Credentials

De Souza (2015: 181) describes Polybius as 'one of the best of all the ancient historians, particularly when it comes to aspects of warfare'. This is not surprising, as Polybius had military experience. Walbank (1979: 13-14) notes that Polybius was elected *hipparchos* of the Achaean League (a cavalry commander). Later, he became a close friend and mentor of Scipio Aemilianus and accompanied him on campaign in Spain and north Africa. Both Heitland (1909: 193) and Lazenby (1996: 5-6) call Polybius trustworthy. Nevertheless, Marsden (1974: 300) contends that 'Polybius had little or no experience at sea and therefore did not understand so well the employment of warships and what happened in action'. But this view reflects the modern division between branches of the armed forces. At the time of the Punic Wars, Roman military commanders were political appointments, rather than military experts (Grainger 2011: 97; Lazenby 1996: 15), whereas the Carthaginian generals were military appointments from the officer class aristocratic families (Lazenby 1996: 20). De Souza (2015: 182) refers to Pédech (1964), that Polybius is focused on 'innovative method of combat (*moyens de combat inédits*)', such as the use of the *corvus* (a form of boarding gangway) by the Romans at the Battle of Mylae (Polybius 1. 22) and 'tactical

manoeuvres', such as where the Carthaginians tried to envelop the Romans' wedge-shaped formation as at the Battle of Ecnomus (Polybius 1. 26-28).

Nevertheless, no other ancient authority mentions the use of the *corvus* and the battle formation at Ecnomus is the same formation used at Cannae (216 BC). Polybius' account of the Battle of the Aegates lacks details of the tactics employed, perhaps to underplay the role of the acting commander Quintus Valerius Falto.

Battle of the Aegates

The final battle of the First Punic War was the Battle of the Aegates (241 BC). According to Polybius the Carthaginian forces were besieged at Mount Erix, west Sicily (Polybius 1. 59). A Carthaginian relief force under Hanno, heavily loaded 'with corn and other provisions', was sent to resupply and reinforce their army (Polybius 1. 60). The Carthaginian fleet, which was manned with an enlisted crew and novice mercenary recruits (Polybius 1. 61) approached *Hiera* (Holy Island), modern day Marittimo, from the southwest, intending to sail north of *Phorbantia*, modern day Levanzo, and beyond towards Bonagia Bay to relieve their besieged army.

The Roman fleet of quinqueremes was under the overall command of Gaius Lutatius Catulus, but because he was wounded, his lieutenant, Quintus Valerius Falto, temporarily took command. The Romans had trained their crews how to row (Polybius 1. 59), and the marines were hand-picked veterans (Polybius 1.61). The Romans were aware of, or guessed, the Carthaginian plans and may have waited behind Levanzo for the Carthaginians to approach, possibly evidenced by the collection of Roman anchors found behind Levanzo, which may have been abandoned before the battle (see Filippi 2005; Tusa 2005). Polybius reports (1. 60) that a 'strong breeze' was blowing towards the northeast, and that the seas were 'rough and boisterous'. The Romans decided to intercept the Carthaginian fleet, despite the poor weather conditions, which were not suited to galley warfare (see Vegetius, *Epitome of Military Science*, 4. 43).

Polybius gives few details of the battle, only that the Romans approached in a single line (1. 60). Meanwhile, the Carthaginians lowered their masts and engaged. Nothing is said about tactical manoeuvring and there is no mention of the use of the *corvus*. However, the Romans soon gained the upper hand, presumably because the Carthaginians were 'heavily loaded and so difficult to manoeuvre in action' (Polybius 1. 61). It was a decisive victory for the Romans and Polybius (1. 61) reports fifty Carthaginian ships sunk, seventy captured, and ten thousand prisoners taken. Polybius is silent about Roman losses, but other historical accounts record different casualties on both sides (see Murray 2019: 37, Tab. 2.1). The Carthaginians, exhausted by twenty-four years of fighting, were forced to sue for peace and capitulated to the Treaty of Lutatius granting ownership of Sicily to Rome.

The Discovery of the Naval Battlefield

Despite the historical narrative, there are significant gaps in archaeologists' knowledge about the First Punic War, Lazenby (1996: x) notes that 'we do not even know exactly what a quinquereme was, and this was the principal battleship of both fleets'. It is hoped that the ongoing discoveries at the Egadi Islands may provide evidence. Investigations began in 2004, when the Carabinieri seized an ancient bronze naval ram, or *embolus*, from a private collector in Trapani, Sicily (Tusa and Royal 2012: 11; 2019: 23). This ram, now known as Egadi 1 (Figure 2), had undoubtedly been found in the sea by fishermen. The Soprintendenza del Mare, Regione Siciliana, the late Sebastiano Tusa, recognised the significance of the find of an extremely rare naval ram (Tusa and Royal 2019: 23), as at that time only three other main rams were known to be in existence (the Piraeus Ram (Murray 2012: 49), the Bremerhaven Ram (Murray 2012: 49) and the Athlit Ram (Casson and Steffy 1991). He followed the trail back to the fisherman responsible, who revealed that it had been entangled in a net, off the northwest coast of Levanzo. This led the Soprintendenza to speculate that it was the remains of a warship at the Battle of the Aegates (Tusa and Royal 2019: 23).



Figure 2. Photograph of the Egadi 1 Ram, recovered from a smuggler of antiquities in 2004, in Trapani, Sicily. Reportedly retrieved by fishermen from the sea, northwest of Levanzo Island, Sicily (Photo by RPM Nautical Foundation and Soprintendenza del Mare, Regione Siciliana Archives).

A cooperation between the Soprintendenza del Mare, Regione Siciliana and RPM Nautical Foundation conducted a targeted, systematic survey of the area between Levanzo and Marettimo (Tusa and Royal 2012: 11; Tusa and Goold 2019: 15-6). For three seasons nothing was found, but in 2008 the Egadi 2 ram was discovered circa 10km northwest of Levanzo Island (Tusa and Royal 2012: 15). This was the first ram to be found by deliberate investigation by maritime archaeologists. Since then, a total of twenty-six rams, together with Montefortino helmets, weapons, and amphorae have been recovered, evidencing the first documented ancient naval battlefield.

Sadly, the sandy seabed and the absence of a protective cargo means that no hulls survive from the battle. But rams survive, they were cast in bronze, using the lost-wax method, and formed on the bow timbers of the completed galley (Steffy 1991: 38-9; Oron 2006). Each ram has a socket unique to its galley. Therefore, the design of a galley might be extrapolated using its ram, as ancient historians failed to record these details. Octavian's Trophy Monument at Nikopolis, modern day Preveza, Greece, has provided archaeologists with tantalising clues on the size of rams in proportion to each other. This monument was built to commemorate the defeat of Marc Antony and Cleopatra at Actium (31 BC); thus, it is not contemporary with the Battle of the Aegates by over two hundred years. The monument has a line of sockets of various sizes, where over thirty rams from the captured ships would have been on display (Murray 2007). Therefore, it is reasonable to suppose that if all the galleys present at the battle were represented, then the smallest socket might be for a 'one' and the largest for a *dekeres* (a 'ten'). However, the Athlit Ram, weighing 465 kilograms, is too small to fit any of the sockets, which suggests it is from one of the smaller classes (Murray 2012: 44). As some sockets are missing it is difficult to make a definitive assessment, but Murray (2012: 32) suggests that the Athlit ram fitted a quadrireme.

The battlefield has raised more questions than answers (Tusa *et al.* 2021: 177). For example, the rams themselves are mostly Roman; they all appear to be of a similar design and of the same class; and finally, the rams appear too small to be from quinqueremes. The latest published data, up to and including season 2019, demonstrates that of the first twenty-three rams discovered only two are Carthaginian and six are unknown (due to damage or because they have not been recovered from the seabed) (Tusa *et al.* 2021: 172). It seems curious that the majority of rams discovered belong to the winning side. However, Murray (2019: 37-38) concludes that the Carthaginians re-fitted and re-used captured warships from the Battle of Drepanum, eight years previously, where they had captured 93 Roman ships (Polybius 1. 53).

Class of Warship at Egadi

Polybius' account of the Battle of the Aegates infers that it was between Roman and Carthaginian quinqueremes and that the Carthaginians loaded their warships with munitions (Polybius 1. 60-61). There is no mention of transports or other classes of warship in Polybius' account, however Diodorus (24. 11. 1.) refers to warships, merchant ships and transports. In addition, Lazenby (1996: 155) refers to a fragment of poetry from the Roman poet Naevius (fr. 48 Buechner), who was contemporary with the First Punic War, which may refer to this battle and it mentions 'laden transports wallowing in the swell'. These sources suggest that other types of ships may have been present at the battle. However, Tusa *et al.* (2021: 176) argue that the deposition of amphorae, which are distributed over a wide area, were carried by warships, as there are too few to be carried by transports. However, Landels (1978: 151) claims that a trireme had no officers' quarters, crew quarters, food stores or a galley, which suggests that there would be little room for storage below decks. The evidence from the trireme reconstruction *Olympias* supports this contention (Morrison *et al.* 2000: 131). Therefore, if amphorae were carried on deck, this could hamper the ship's fighting ability and could also suggest that fewer marines were

carried by the Carthaginians than normal (Lazenby 1996: 153). The numbers of casualties are also inconsistent with quinquereme losses. Polybius (1. 26. 7) states that Roman quinqueremes had 300 rowers and 120 marines, and assuming the Carthaginians had something similar, then 10,000 prisoners from 70 captured warships (a total complement of 29,400 crew and marines) suggests that either many were killed in action, or that the size of the ships was exaggerated by Polybius.

The physical evidence from Egadi also suggests that Polybius may have exaggerated, as the rams and the fragments of hull within them, recovered from the battlefield, have been assessed to be from warships circa 25-28 metres in length, consistent with the size of a small trireme (Tusa and Royal 2012: 41-2). Tusa and Royal (2012: 40-1) argue that the warships probably had thicker strakes between the keel and the first wale to provide longitudinal strength, to explain the diminutive size of the keels on the Egadi warships (which do not seem to be much bigger than the keel of the 14 metre Kyrenia ship, a late fourth century merchant ship). Murray (2019) comes to a similar conclusion, that the rams are from 'relatively small warships, no larger than triremes' but he reaches this conclusion by a different method. Murray (2019: 34) concludes that the Egadi rams would be too small to fit any of the sockets of the Actium Monument. However, as the Battle of Actium (31 BC) was over two hundred years after the Battle of the Aegates, there is likely to have been significant development of warship design in that time (Tusa and Royal 2012: 35). Thus, the Actium Monument may not be a relevant comparison to the rams at Egadi. Nevertheless, Murray's conclusion accepts that the Egadi Rams could be from triremes or from ships smaller than triremes, which suggests there is room for alternative interpretations of the class of the warships found at Egadi.

Murray (2019: 38) points out that pentekontors, triremes and *lemboi* are recorded in Roman fleets; and triremes, quadriremes, pentekontors and light ships called *kerkouroi* or *akatia* in Carthaginian fleets. Polybius (1. 53. 9) refers to *lemboi* as 'light reconnaissance craft which normally cruise ahead of the fleet'. Torr (1854: 115-6) writes that *lemboi* were different to regular warships because they had a larger beam and carried no ram. He cites passages in Livy (32. 32. 9) and Polybius (18. 1) of the same incident where four *lemboi* were travelling with a warship armed with a ram. By implication the four *lemboi* were unarmed.

However, Morrison and Coates (1996: 263) refer to passages in Livy and Virgil where *lemboi* have rams. Casson (1971: 126) concludes some *lemboi* would have been armed and some would not, and there would be considerable variation in size, as some could have up to fifty rowers and could be either a monoreme or bireme. He cites a passage in Polybius (Loeb edition, 16. 4. 8-12) where the Macedonian *lemboi* 'were either falling foul of their oars and making it difficult for them to row, or else attacking them in the prow and sometimes in the stern, so that neither the pilots nor the oarsmen could serve efficiently'. Casson (1971: 126, Note 107) concludes that no ship would act in this way, to pester the enemy battle line, without being armed with a ram. Casson (1971: 162, Note 36) refers to the fact that *lemboi* could be used to carry cargo. He refers to an account in the Cairo Zenon Papyri (59015) of 'one *lembos* carrying 258 18-chous jars (circa 12,900 litres) and 102 half-jars (circa 2550 litres) of oil from Samos and Miletus to Alexandria'. It would be a useful exercise to compare this capacity to the number and size of

amphorae found at Egadi. Thus, *lemboi* were fast, manoeuvrable, capable of carrying munitions and, because some were armed, could take a place in the battle line.

By way of comparison, the recently published Phanagoria wreck was a military bireme galley of 19-20 metres in length, which was dated to the first half of the first century BC. This has been tentatively identified as a *hektontore* (Boetto *et al.* 2022: 23). It was armed with a small ram weighing 15.6 kilograms, which is 'more a casing reinforcing the cutwater than a powerful weapon' (Boetto *et al.* 2022: 23). Interestingly, Boetto *et al.* (2022: 19) report that the Phanagoria wreck was also armed with an oak *proembolion*, a secondary ram, which fitted above the waterline main ram (see Adams *et al.* 2013; Pridemore 1996, for a description of *proembolion*). No *proembolion* have been found at Egadi (Tusa *et al.* 2021: 177). However, this absence could be explained if the *proembolion* of these warships were made of wood, which is unlikely to survive in this context. The primary ram on the Phanagoria wreck is not directly comparable to the rams found at Egadi, as the first ten rams which were raised, excluding those damaged, have an average reconstructed weight of 160.48 kilograms (see Royal and Tusa 2019: 44, Tab. 3.1). However, the Phanagoria wreck demonstrates that even a modestly sized galley could have a ram.

The Roman Shipbuilding Programmes

Polybius writes (1. 20) that in 261 BC, at the start of the First Punic War, the Romans did not have any *kataphraktoi* (ships with protective screens to defend the crew from missiles) or even a single *lembos*. Polybius is keen to emphasise Roman ingenuity to develop from nothing, but many scholars, including De Souza (2015: 189), Goldsworthy (2000: 96) and Morrison and Coates (1996: 43) quite rightly express surprise and distrust of this statement, and the list of references to diplomatic missions and the existence of naval treaties prior to the First Punic War provides evidence to negate Polybius' claim (D'Amato 2015: 5-8; Harris 2017). Steinby (2007: 29) argues that Rome had an 'efficient and powerful navy' even before the First Punic War.

Why Roman galleys have a similar design to the Carthaginian galleys is explained by Polybius (1. 20. 13-16), who writes that at the start of the conflict a Carthaginian cataphract ran aground and was captured by the Romans and this was used by the inexperienced Roman shipwrights as a model to build a fleet of one hundred quinqueremes and twenty triremes. Heitland (1909: 195) comments that 'the tale is highly coloured in the course of boastful tradition', however Goldsworthy (2000: 100) believes that there is 'no good reason to reject this evidence'. The truth is difficult to determine, but it seems logical to match your enemy. However, it seems odd that the Romans did not consult their allies, the Syracusans, who were associated with the early development of the quinquereme over one hundred and fifty years earlier (according to Diodorus 14. 42. 2. contra Pliny, *Natural History*, 7. 57, who says it was the Salaminians).

Towards the end of the conflict Polybius (1. 59. 7-8) writes that in 243-242 BC wealthy Roman citizens funded the building of a fleet of 200 quinqueremes 'constructed on the model of the ship originally captured from Hannibal, "the Rhodian"'. It is not entirely clear what kind of warship Hannibal 'the

Rhodian' commanded, but Polybius (1. 48) describes it as being 'exceptionally well-constructed'. It was captured by the Romans using a Carthaginian quadrireme which had also run aground. In the Second Punic War Livy (30. 25. 6) describes an action between two Carthaginian quadriremes and a Roman quinquereme where the marines of the quadriremes could not board the higher bulwarks of the quinquereme. Therefore, how could the captured quadrireme defeat Hannibal's ship, if the latter was a quinquereme? Morrison and Coates (1996: 53) conclude that Hannibal's ship must have been a quadrireme. It is generally accepted that quadriremes had two tiers of rowers, with two oarsmen on each oar and that quinqueremes were bigger, with three tiers of rowers with two rowers on each oar in the two upper tiers and a single oarsman in the lowest tier (Murray 2012: 251-68).

Using iconography Morrison and Coates (1996: 43, 270) argue that Roman and Carthaginian quinqueremes followed a similar design to each other. For example, a galley depicted on a Carthaginian grave stele, dated to the 3rd century BC (Morrison and Coates 1996: 214, Fig. 15) (Figure 3), shares similar features (such as the deep oarbox and heavy stemposts) to the galleys depicted on a patera from Cales, Italy, dated to the 3rd to 2nd century BC (Morrison and Coates 1996: 216-7, Figs. 18 Ia and 18 Ib) (Figure 4). There are differences, for example the Carthaginian stempost sweeps forward in a drum, while the Roman stempost is stumpy and undecorated. The galleys depicted on the patera from Cales has three tiers of rowers, which led D'Amato (2015: 10-1) to conclude that these are triremes, whereas Morrison and Coates (1996: 217) consider that there is a 'strong probability' that these are quinqueremes.



Figure 3. Photograph of a Carthaginian grave stele, 3rd century BC (After Morrison and Coates 1996: 214, Fig. 15; Bartolini 1979A: B.823).

If the Roman fleet was modelled on the galley of Hannibal 'the Rhodian' then this either represents a change in strategy by the Romans to use smaller quadriremes which were 'more mobile, faster and more manoeuvrable' (Grainger 2011: 97), or an improvement in quinquereme hull design to make them 'lighter and more manoeuvrable' (Morrison and Coates 1996: 54). In either case, Lazenby (1996: 154) argues it could demonstrate a change in tactics from boarding to ramming, and this could be evidenced by training of the Roman rowers who needed to be skilled for ramming tactics (Polybius 1. 59). Lazenby

(1996: 154) reads the Carthaginian casualty list of 50 sunk and 70 captured as evidence against the Romans adopting ramming tactics. However, this implies that warships are only captured by boarding, whereas a rammed galley might not necessarily sink and could still be recovered. Polybius uses the word κατέδυσαν to describe the Carthaginian ships translated as 'sunk', but Landels (1978: 148) says that 'the Greek word "*kataduein*", which is invariably translated as "sink" in fact means no more than "dip" or "lower" and when a Greek writer wishes to indicate that something "went to the bottom" he generally uses a different word'. No doubt some galleys sank to the seabed, but some may have been 'swamped' and therefore recoverable (Casson 1991: 82).



Figure 4. Close up photograph of the interior of a patera from Cales, Italy, signed by the potter L. Canoleios, dated to the 3rd-2nd century BC (Morrison and Coates 1996: 216-7; D'Amato 2015: 10-1)
(Photo by D. Carro, courtesy of the Museo Archeologico Nazionale, Napoli).

Tactics

Polybius gives few details of tactics at the Battle of Aegates, however, the rams discovered at Egadi may offer some clues. The traditional explanations why warships developed the way they did are clearly inadequate, but a new, better, scholarly consensus has not been established. Naval warfare in the Classical period is defined by combat between fleets of triremes. Casson (1991: 76) describes triremes as an 'oar-driven torpedo', with ramming as the dominant tactic in the Classical period.

However, trireme warfare was more than simply ship-to-ship duelling. An individual trireme was part of what might be called a 'weapons system' of many elements. They fought in groups as part of squadrons or fleet, they needed well-trained crews, and substantial infrastructure was needed to build and maintain each trireme.

Murray (2012: 3) describes the development of bigger warships during the Hellenistic period as an 'intense arms race', where Alexander's successors competed to build bigger warships than each other. Multi-tiered galleys, with different numbers of rowers on each oar, developed to become the standard

vessels for fleets across the Mediterranean. The name of each type of warship seems to have referred to the arrangement of the rowers and not the number of tiers, as more than three tiers may be impossible (Morrison and Coates 1991: 1). In addition to increases in size there were also innovations in the ‘technique, tactics and strategy of war’ (Grainger 2011: xvii).

Morrison and Coates (1991: 285) argue the development from trireme to a quinquereme was motivated by the need to increase the number of marines on board, and that the ram was retained as ‘a secondary weapon of opportunity’. Goldsworthy (2000: 102-3) agrees, the ‘emphasis on larger and larger warships diminished the importance of the ram, since such vessels were slower and less manoeuvrable’ and also comments that boarding tactics placed less demand on the rowers. However, Tarn (1930: 145) writes that ramming or boarding tactics were not mutually exclusive, but the ‘dominant tactics of a fleet had to be one or the other’. Casson (1991: 78) explains that fleets trained for ramming would ‘make the first move’ while heavier, less manoeuvrable fleets would wait for an attacker to approach and then they would board it. Ramming tactics require skilled rowers and these may be in short supply during a long war where there have been heavy casualties, as in the case of the First Punic War. A further advantage to having larger warships with several rowers per oar, is that only one skilled rower would be necessary (Tarn 1930: 148). In addition, it takes time to train a crew ramming manoeuvres and this is costly because you have to keep warships in commission for longer.

Murray (2012: 5) rejected Tarn’s conclusions and maintains that ‘ramming tactics must have formed an integral part of the combat’ in naval conflict in the Hellenistic period. Murray (2012: 29) argues that the tactic of frontal ramming prompted the development of larger warships in the early fourth century BC. However, there is limited historical and physical evidence to prove this concept of causation. Nevertheless, during the First Punic War the Carthaginians appeared to rely on ramming, whereas the Romans initially preferred to board (Lazenby 1996: 28-9). The historical narrative and archaeological evidence from the Battle of the Aegates seems to support the contention that ramming played a significant part of the battle.

However, the archaeological evidence of ramming is limited, as until recently so few rams had been found. A detailed analysis of the Hellenistic Athlit Ram demonstrated that it was made of three blunt fins on a central post. It was designed to shatter the seams of the enemy’s hull, rather than pierce the hull which could either damage the attacker or render the attacker stuck to its victim (Casson 1991: 78; Steffy 1991: 38). Royal (2019: 289) in his assessment of ten of the Egadi Rams, notes that all except one show damage to their heads, and several show frontal impacts. Indeed Ram 3 (Figure 5) shows an impact consistent with an impact with the central post of another ram, i.e. prow-to-prow ramming (Tusa and Royal 2012: 17). Casson (1991: 78) believed that prow-to-prow ramming was avoided ‘as the odds for causing serious damage were too poor’. There must have been a chance that a commander could cause serious damage to his own craft by the force of impact of his own ram, or by being hit by the ram of his target. There are examples of fleets reinforcing their trireme bows, such as the Syracusans who attacked the Athenians in 413 BC prow-to-prow (Thucydides 7. 36).

Similarly, Polybius (16. 4. 11) refers to the battle between the Rhodians and the Macedonians at Chios in 201 BC, where the Rhodians prepared for prow-to-prow encounters by depressing their bows (perhaps by moving ballast) so that their ram would pierce underwater which could not be repaired, but they would receive a blow above the waterline. However, it is clear that prow-to-prow tactics were certainly not the norm for triremes, and ships required modification to do it.

Murray (2019: 40) suggests a squadron of Carthaginian triremes may have met the Roman fleet who 'targeted their bows and sides' to explain the battlefield deposition. This explanation is plausible, but it is also possible that the Romans may not necessarily have targeted the Carthaginian bows, as the 'prow first' manoeuvre is also a defensive tactic, as described by Herodotus (8. 11. 2) at the Battle of Artemision in 480 BC and may reflect that the outclassed Carthaginians turned to face their opponents with prows first.



Figure 5. Photograph of the Egadi 3 Ram (Carthaginian) (Ex Stabilimento Florio della Tonnare di Favignana e Formica, Favignana. Soprintendenza del Mare, Regione Siciliana) (Photo by the Author, 2022).

Discussion

Polybius' narrative of the Battle of the Aegates is short on details. The Roman fleet of quinqueremes, modelled on a fast Carthaginian warship, had well-trained crews and hand-picked marines. In contrast, the Carthaginian fleet of quinqueremes were laden with cargo, with enlisted crew and novice marines. It was a windy day with rough seas, which were poor conditions for a naval battle. The Romans had the element of surprise and chose not to waste it. They attacked the Carthaginians, against the wind, in a battle line. Polybius says little else, except that the Romans enjoyed a resounding victory.

The recent discovery of twenty-six Roman and Carthaginian rams off the Egadi Islands, together with amphorae, military equipment, and small finds such as nails and ballast by the Soprintendenza del Mare, RPM Foundation, and the Society for the Documentation of Submerged Sites, provides valuable evidence for this particular engagement and more generally the development of warships in the Hellenistic period.

It is inferred from Polybius' account that the battle was between quinqueremes, but the Egadi rams are almost four times smaller than the Athlit ram. All the Egadi rams are from the same smaller class of warship. In which case either Polybius completely exaggerated, and no quinqueremes were at the battle, or partially exaggerated and the Roman and Carthaginian fleets also had other classes of warship present on the battlefield. Diodorus refers to other types of ships at the battle, and the numbers of prisoners do not agree with the number of ships captured. Archaeologists must be mindful of 'reverse survivorship bias', that various factors may have influenced rams of the same class to become part of the archaeological record and not other classes. For example, these rams and other artefacts have been found on the seabed surrounded by rocky outcrops which have protected them from dragnet fishing. Perhaps ships of different classes fought elsewhere, and either the bigger rams have not survived as part of the archaeological record or are yet to be found given the substantial size of the battlefield.

It is argued that the remains of the warships found at the Egadi Islands were from triremes. However, this assessment is based on a projected hull length of 25-28 metres, which is small for a trireme, and the length relies on the lower strakes between the keel and the first wale being thickened to provide longitudinal strength. Details of investigations on the hull fragments found within some of the rams has yet to be published, therefore it may be too early to make this judgement. The absence of any sockets the size of the Egadi rams on the Actium Monument may be significant, that they were of a class so small that they were not worth commemorating. However, due to the length of time between the two battles the rams displayed at the Actium Monument may not be comparable. Nevertheless, this paper contends that there is insufficient evidence to prove that the rams came from triremes. However, it is possible that they may come from another class of ship known as *lemboi*, which were fast, manoeuvrable and adaptable. Some *lemboi* were armed with rams, and they came in a range of sizes from a skiff to a bireme (Casson 1971: 126). In addition, *lemboi* could carry cargo (Casson 1971: 126, Note 107), unlike warships, which were unlikely to have superfluous storage space.

The damage visible on the Egadi rams is consistent with prow-to-prow ramming. However, it should be noted that this style of attack is a feature of ships which were designed to withstand the forces. The fact that these galleys were sunk could suggest a defensive tactic which failed against ships which were heavier or designed for prow-to-prow ramming.

Conclusions

The recent finds at Egadi demonstrate that Polybius' account of the Battle of the Aegates is unreliable. The archaeological record suggests that the action was more complex than described and different classes of warship were present. The First Punic War described by Polybius is essentially a story of Roman ingenuity, as they borrowed and improved Carthaginian designs and learned from their mistakes. It is assumed that they adopted sophisticated ramming tactics at the Battle of the Aegates as boarding is not mentioned by Polybius. However, if maritime archaeology can demonstrate that the account of the Battle of the Aegates is unreliable, then it could suggest that the accounts of the other naval battles may also be unreliable.

This paper suggests that the Egadi rams may be from a versatile craft known as *lemboi*, or a craft smaller than a trireme. Further research is required to explore the validity of this possibility. Research on the rams and the fragments of hull within them may help explain the design of the warship, and the type and provenance of the timber used. The battlefield area is vast, and investigations are ongoing. There is still hope that other larger classes of warship may yet be found.

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Implementing *in situ* Protection of Iron Cannon at the Cape Franina Site: Experimental Use of Cathodic Protection

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Abstract

The remains of a late 16th/early 17th century shipwreck were discovered off the Franina Cape in Croatia's Istria County. Found along with the wooden ship's structure - in a very good state of preservation - and its singular cargo, were three iron cannon and two iron anchors. As of 2021 the conservators and archaeologists of the International Centre for Underwater Archaeology in Zadar have implemented a new method of protecting the cannon, applying cathodic protection adopted from the iron and steel industry, where it has proved highly effective. At the Franina Cape site the west cannon has been conserved on the seabed; monitoring of the protective effect and measurement of the cannon's corrosion potential is performed on a regular basis.



Figure 1. The position of the wreck off the Franina cape (Photo by R. Scholz).

Discussion

The Franina Cape lies in the Adriatic Sea, at the tip of the Istrian peninsula. A post-medieval shipwreck with iron cannon and anchors was found in the waters off this cape at a depth of 23 metres (Figure 1).

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The three iron cannons identified at the site are attributed to the sunken ship, while further investigation is needed to ascertain if the two iron anchors near the site were also from this ship. Among divers the presence of a shipwreck at this site had been a topic of discussion over several decades, during which time the wreck suffered partial looting. In 2020 the International Centre for Underwater Archaeology in Zadar launched the systematic archaeological investigation of the wreck site with the aim of preventing further devastation. The well-preserved wooden structure of a ship, with outer and inner planking and frames, was found under a layer of sand (Figure 2).

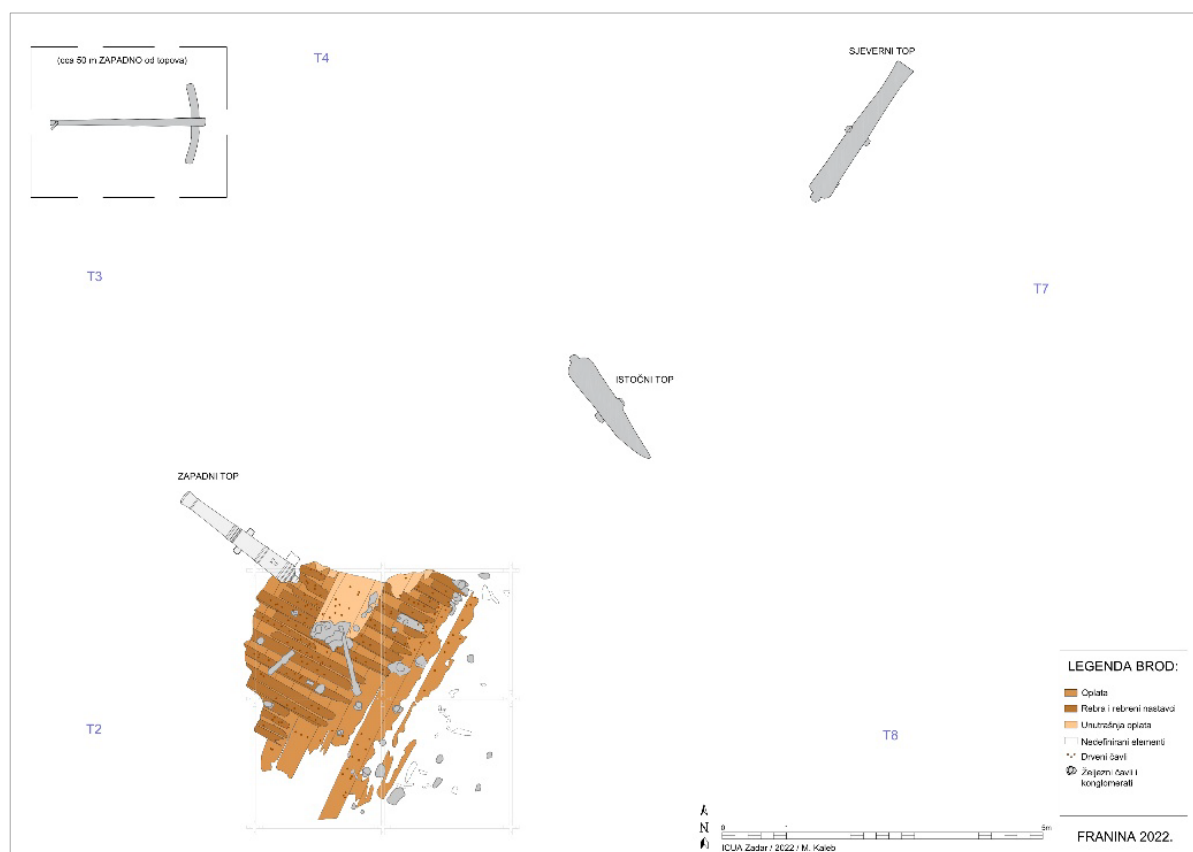


Figure 2. Plan of the site with the ship's structure and the positions of the cannon indicated (Elaboration by M. Kaleb).

The site yielded the finds of numerous artefacts of interest from the ship's cargo and crew. Notable among the cargo finds are natural brass trumpets; a very rare find and an artefact kept at only a handful of museums around the world. Based on the finds from the ship's cargo and inventory this wreck has been dated to the late 16th or early 17th century (Bekić 2022: 16–23).

The Cape Franina wreck is unique for its experimental *in situ* cathodic protection of iron cannon on the seabed (Figure 3). The cathodic protection method is well known to industry where it is used to protect iron and steel structures and ships. The protection works on the principle of physical contact between two metals of different potentials. In contact the metal that is more electronegative is consumed, while

the metal that is more electropositive is protected. Zinc or aluminium, being more electronegative metals, are used when protecting iron or steel. Having observed favourable outcomes in the cathodic protection of archaeological and historical metal objects in the sea as implemented by experienced conservators in Australia and France (MacLeod 1996, 2018; Memet *et al.* 2007), the conservators and underwater archaeologists with ICUA decided to implement this method on the iron cannon at the Franina site.

The *in situ* protection at the Franina site is unique in that the cannon, besides having been provided cathodic protection, was also cleaned of corrosion deposits and encrustation while on the seabed for the purpose of detailed documentation and subsequent underwater presentation.

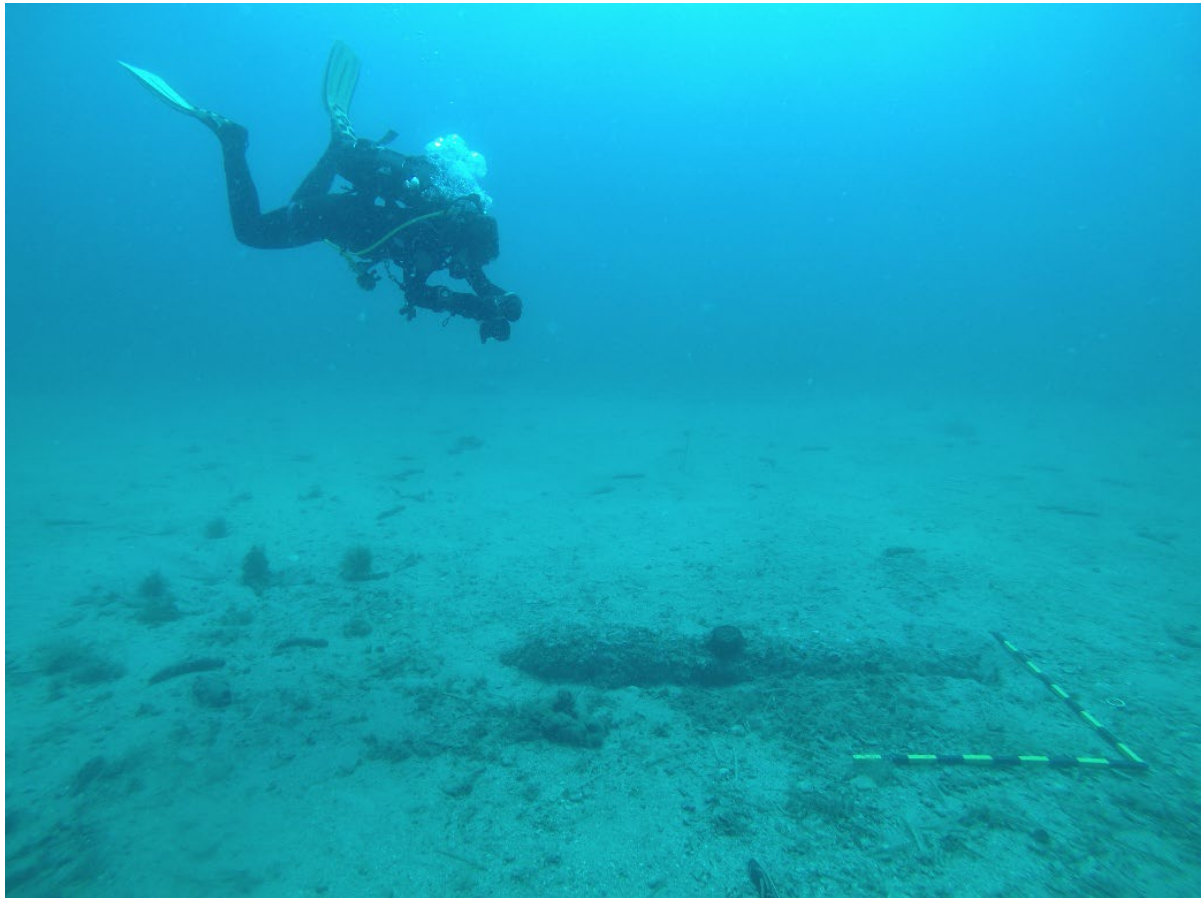


Figure 3. The west cannon prior to conservation work (Photo by L. Bekić).

The *in situ* protection project was launched in 2021 and has been implemented parallel to the archaeological investigation of the wreck. The west cannon was the first to undergo the conservation intervention. The west cannon was found lying on the site surface, i.e. it had not been buried in the sand. It was entirely covered by a thick layer of corrosion and the deposits of marine organisms.

Detailed photographic documentation of the cannon was produced prior to the start of the conservation intervention, whereupon it was set on a pair of wooden beams with recesses using air lift bags. This was

followed by the removal of concretions and layers of corrosion from the surface of the cannon by the combined use of pneumatic and hand tools (Figure 4). The cleaning of the entire surface of the cannon revealed the engraved mark of the cannon's manufacturer. A lead vent cap covers the touch hole (vent) to prevent the intrusion of water when at sea.



Figure 4. Conservation work on the west cannon (Photo by R. Surić).

Detailed photographic documentation of the cleaned cannon and a digital 3D model were produced. Based on the form and characteristics of this cannon it has been attributed to English manufacture of the late 16th or early 17th century (Bekić 2022: 22–23). The following step in the conservation of the cannon was to affix a sacrificial anode to the structure of the cannon (Figure 5). To this end a zinc anode was affixed to the cannon with a screw.

An inspection of the site in the spring of 2022 found that the zinc anode had been almost entirely consumed, demonstrating that the protection was effective. Archaeological excavation and conservation work continued at the site in the summer of 2022. The zinc anode was replaced by two larger aluminium anodes, each weighing four kilograms. Based on the calculations the total of eight kilograms of aluminium should protect the cannon over the following six to seven years, whereupon it

will be necessary to install new anodes. The aluminium anodes were connected to the structure of the cannon by means of cables.



Figure 5. The west cannon following the conservation work and the installation of aluminium anodes (Photo by R. Surić).

Conclusion

Not even the slightest trace of new corrosion has been observed on the west cannon since the anodes were installed. From the visual inspection alone, it was evident that the cathodic protection was effective and that the cannon has been stabilised. Further confirmation of the successful protection was provided by measurement of the cannon's corrosion potential (Figure 6). The potential was measured using a multimeter with a silver chloride (AgCl) reference electrode, housed along with a pH metre in a measurement enclosure adapted for underwater use. Corrosion potential was measured at four points on the cannon, yielding a measured range of from -805 to -821mV, which demonstrated that the cannon is well protected and meets the criterion of a minimum -100mV difference in potential in relation to the initial measurement of -596mV.

The cathodic protection method has shown very good results in preserving the iron cannon on the seabed, and ICUA conservators and archaeologists have decided to implement the same method in the

coming years on the remaining two cannon at the Franina site and to consider the possibility of protecting the iron anchors at the site using this method.



Figure 6. Measuring the corrosion potential of the west cannon (Photo by R. Surić).

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Roman-Era Northwestern Adriatic Sewn Boats: A Local Tradition Tied into the Broader Mediterranean World

Staci Willis¹, Massimo Capulli²

Abstract

Nautical archaeology and the study of ancient shipwrecks have much to contribute to the theme of ‘Ideas that traveled by the sea’. Those ideas were, after all, carried by ships in the form of people and things. But what if we looked at the ships themselves. What could they tell us about the connectivity of the ancient Mediterranean world and the ideas that crossed seas?

The sewn boats that were built along the northwestern coast of the Adriatic Sea during the Roman Period show several connections to the broader Mediterranean world, embedded within the materials and methods used to construct their hulls. This paper will examine this seemingly inconsequential and peripheral tradition of local boatbuilding and explore the evidence that connects these vessels across the Adriatic Sea to the shores of modern Croatia, up the rivers of continental Europe, and all the way to Spain and North Africa.

Northwestern Adriatic Sewn Vessels: An Overview

This paper will discuss the Roman-era Northwestern Adriatic tradition of sewn plank boats and what the remains of these vessels can tell us about the connections that existed across the ancient Mediterranean world. Before diving into the evidence for connectivity embedded within the boats themselves, let us first start with a brief overview of this particular tradition of shipbuilding.

Remains of the boats are found primarily along the northwestern Adriatic coast between Aquileia and the Grado lagoon to the north and the Po River delta to the south, with remains found as far south as Cervia and as far inland as Padova and Oderzo (Figure 1). The evidence for this tradition of boatbuilding spans from 800 to 1600 years. The earliest date is a wood fragment with holes drilled along one side that dates to the 6th to 5th century BC and the most recent date is to the 11th century AD. Both ends of this timeline are disputed, but there is definitive evidence from the 2nd or 1st century BC to the 6th or 7th century AD (Beltrame 2002: 353-73; Berti 1990; Bonino 1968; Bonino 1985: 87-104; Capulli and Pellegrini 2010: 263-6; Capulli *et al.* 2016: 215-8; Castro and Capulli 2016: 29-41; Trovo 1996: 119-34; Willis and Capulli 2017: 147-50; Willis and Capulli 2018a: 9-13; Willis and Capulli 2018b: 343-56).

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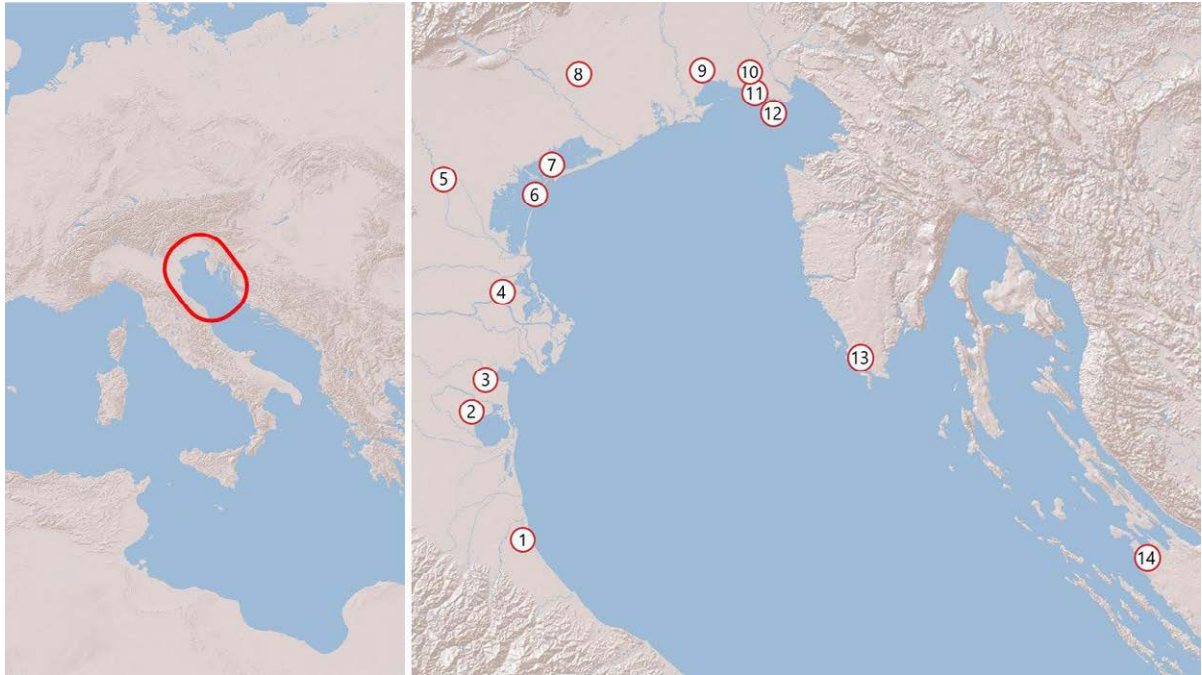


Figure 1. Map showing the location of Adriatic sewn boats mentioned in the text: 1) Cervia, 2) Padovetere, 3) Comacchio, 4) Corte Cavanella, 5) Padova, 6) Venice Lido, 7) San Francesco del Deserto, 8) Oderzo, 9) Stella, 10) Canale Anfora, 11) Gorgo Island, 12) Grado, 13) Pula, 14) Zaton (Nin) (Elaboration by M. Capulli).

The exact number of remains that are part of this assemblage varies depending on what is included, but so far there are about 22 discrete finds. These come from a wide variety of contexts and have been found in quite varied states of preservation. There are partially complete hulls, like the Stella 1 barge and the Comacchio ship, though many finds are disarticulated and/or fragmentary hull remains like the Venice Lido timbers and others (Beltrame 2002: 353-73; Berti 1990: 29-34; Castro and Capulli 2016: 29-41; Willis and Capulli 2018b: 343-56). Some finds of this tradition are clearly within their primary context representing shipwrecks or abandoned hulls. In many other cases, the hull planking of these sewn vessels is found not as part of a boat but reused in various structures, like as part of a dock in the case of the Corte Cavanella II remains or as part of a canal wall in the case of the Oderzo timbers (Beltrame 2002: 353-73; Trovo 1996: 119-34). And still others are from unknown contexts as they have washed ashore.

New Evidence of Northwestern Adriatic Sewn Boats

Additional evidence of these ancient sewn boats continues to surface seemingly at a constant rate. Such as the three additional hull planking timbers that washed ashore on Venice Lido in 2018 and 2020, which were studied by the authors. The largest of those fragments - Fr. 1/2018 - is preserved at 2.52m in length and 18cm in width (Figure 2). The other timbers are 50cm long with a 23cm maximum width (Fr. 2/2020) and 69cm long with a 13cm maximum width (Fr. 3/2018).

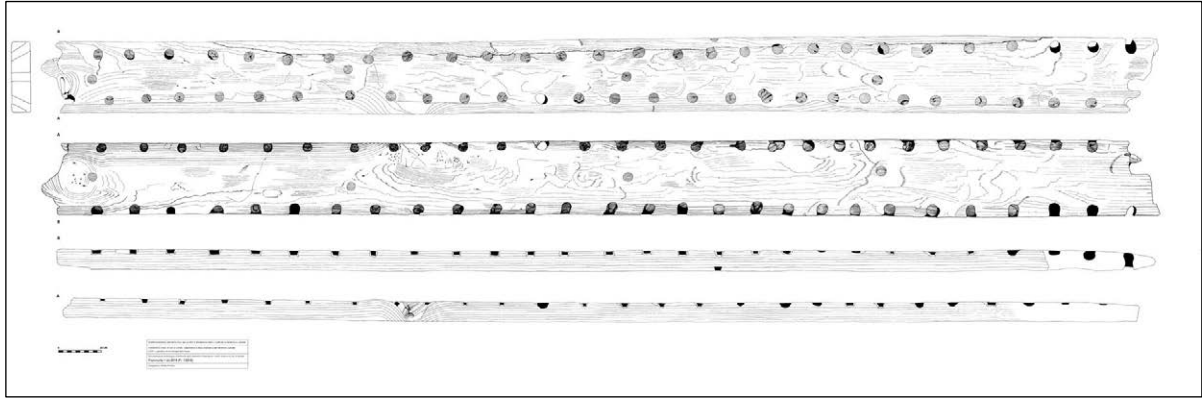


Figure 2. Illustration of Lido di Venezia Fr. 1/2018 (Drawing by Serena Privitera).

These new timbers share similarities with the Venice Lido III assemblage (VL III) that was found in a similar location in 2012, in particular with regards to the size and spacing of the treenails as well as the size and spacing of the sewing channels. The size and spacing of the treenails are remarkably similar to the dimensions seen in Fragments 1 and 8 of the VL III assemblage. Two of the new timbers - Fr. 2/2020 and Fr. 3/2018 - both have sewing channels virtually identical in size and spacing to VL III Fragment 1 (Figure 3). The main new timber - Fr. 1/2018 - has sewing channels of similar width to VL III Fragment 1 but the holes are more circular whereas VL III Fragment 1 is more oval. The spacing of the channels is similar. Dimensions for all three new timbers are summarised in Table 1 alongside those of Fragments 1 and 8 of the VL III assemblage.

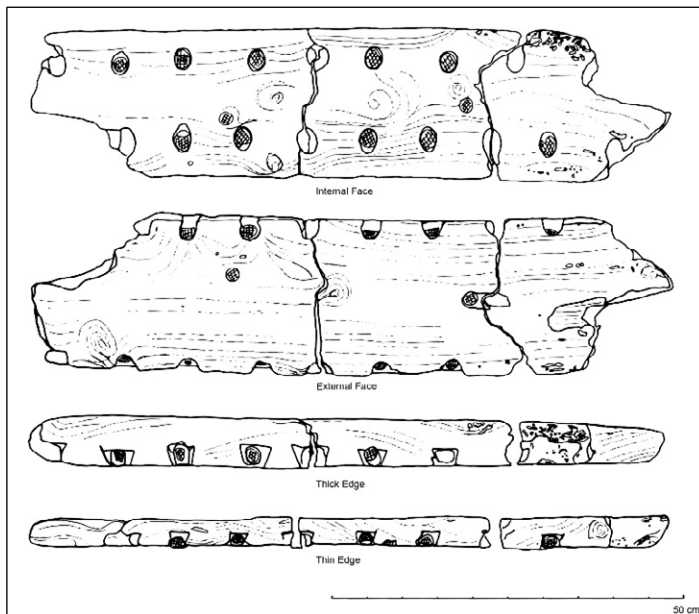


Figure 3. Illustration of Venice Lido III Fragment 1 (Drawing by S. Willis).

Another recent discovery is a sewn hull plank that was found along Grado beach in 2021. It was preserved at 8 metres long and 30cm wide (Costa and Gaddi 2023: 123-31). Additional data on this plank

has not yet been published but the fact it washed ashore likely indicates the presence of the wreckage of a sewn boat in the Grado lagoon.

	Fr. 1/2018	Fr. 2/2020	Fr. 3/2018	VL III Frag. 1*	VL III Frag. 8
Length (cm)	252	50	69	91	200
Max Width (cm)	18	23	13	22	23
Max Height (cm)	5.5	3.5	2.5	7.45 / 4.8	6.1
Size (cm), Sewing Channels, Internal Face	2-2.5 x 2-2.5	3 x 2.5	3.4 x 2.2	3.0 x 2.4 / 3.5 x 2.5	2.3 x 2.0
Spacing (cm), Sewing Channels	7-10.5	5.5-6.5	5-7.5	5.4-8.3 / 5.3-7.2	6.2-9.5
Size (cm), Treenail	2	--	--	1.8-2	2
Spacing (cm), Treenails	59-62	--	--	32	~57

*This timber is tapered along its width with a clear distinction between the thick edge (7.45cm) and thin edge (4.8cm). Dimensions that varied along the two edges are separated by a forward slash (/), with the thick edge dimensions listed first.

Table 1. Dimensions of Key Elements of the 2018/2020 Venice Lido Timbers
in Comparison to Venice Lido Fragments 1 and 8.

And finally, a particularly exciting example, is evidence of sewn hull planks from an old excavation on Gorgo island in the Grado lagoon that co-author Massimo Capulli uncovered recently while conducting archival research (Capulli 2023: 101-22). During the First World War, part of the island was excavated in preparation for building a seaplane base from July to August in 1917. During that excavation an ancient wooden structure and associated artifacts were found. The wooden structure has been interpreted as a cellar and more than 200 amphorae dating from 1st and 2nd century AD were recovered (Rebaudo 2023: 135-54). That wooden structure incorporated planks from a sewn boat (Figure 4). Unfortunately, these planks were almost certainly destroyed after the excavation now over 100 years ago, and the military report of the excavation only provides the length of the largest plank at 6m. Additional dimensions or details of construction were not recorded.

But these new discoveries, in addition to the many others that came before, speaks to the ubiquity of sewn boats in this region during the Roman period. In fact, the upper Adriatic region represents a unique pocket of hull construction in the Mediterranean. It is the only area that maintained a large-scale production of sewn hull construction into the Roman era, and the majority of hull remains that have been discovered from the ancient northwestern Adriatic employed sewn joinery. The dominant shipbuilding method in the Mediterranean at this time was to join the planks together using mortise and tenon joints. While a few mortise-and-tenon joined hulls have been excavated from this region, sewn boats dominate the nautical archaeological record.



Figure 4. Photograph of planks from a sewn boat excavated on Gorgo Island in the Grado Lagoon in 1917 (After Cestelli Guidi and Turco 2016: 49).

Defining the Northwestern Adriatic Sewn Boat Tradition

So, what holds this disparate assemblage of sewn boat material together? What defines this particular tradition of boatbuilding?

There are consistencies across the northwestern Adriatic sewn boats in regard to the technical aspects of the sewing system itself. These include diagonal channels that run perpendicular to plank edge, sewing channels with a diameter typically over 1cm and in some cases closer to 3cm, sewing channels spaced about 5-10cm apart, expanded edge cavities (typically trapezoidal), cross-stitch pattern with clamping turns, and tapered or conical pegs inserted into the sewing channels to secure the stitches (Willis 2016).

Furthermore, there are consistent trends in materials usage, with hull planking of elm, frames made of oak, a wadding of plant material placed along the internal seams made of lime (*tilia* sp.) bast fibers, and esparto grass cordage to sew the planks together (Willis 2016).

These are the consistent features that help to define this tradition of boatbuilding and distinguish it from other sewn boats built in other regions and at other times.

Connections with the Ancient Mediterranean World

But how does this localised and seemingly peripheral tradition of boatbuilding showcase the connectivity of the Ancient Mediterranean world? As will be demonstrated here, those connections are embedded in the methods and materials of construction of these sewn vessels.

Connectivity Embedded in Methods of Construction

Let's start with one of the more iconic examples of this tradition. The Comacchio ship, excavated in the 1980s, was a coastal and riverine craft with a rounded hull, thickened keel plank, and a smooth turn of the bilge that has been reconstructed to a length of about 21m or 70ft (Berti 1990: 29-34). It was carrying a primary cargo of 102 lead ingots from Spain and an assortment of other materials including amphoras of foodstuffs, North Italic pottery, and boxwood logs (Berti 1990: 29-34). And it is normally here, in the cargo of the vessels, that we would look for evidence of connections. And we find it in this case.

But we can also look at the methods used to build the hull as this ship exhibits a case of mixed construction. Although the entire bottom of the vessel is joined together using the sewn tradition, regularly spaced mortises were cut into the top of the first wale (Bonino 1985: 87-104; Bonino 1990: 35-42). This provides evidence for the coexistence of these two separate traditions of boatbuilding likely within the same shipyard. Thus, either the builders of these separate traditions collaborated on this vessel (and presumably others) or the builders in the region were capable of using both methods of construction - connecting these builders to the technologies of the wider Mediterranean basin.

Another case of mixed construction was discovered near the Comacchio ship and excavated more recently in 2015. The fifth-century Padovetere barge also reportedly had mortise and tenon joints used in its construction as well, though once again the entire bottom of the vessel was joined with sewing (Beltrame and Costa 2023: 70). But it also has clinker or lapstrake of the topmost side strakes - a particular type of construction where the planks overlap each other and are joined together with nails. This method of nailed lapstrake side planking is commonly seen in boats along the Rhine river in Central Europe such as the Zwammerdam barges. Once again, the combination of different construction methods in these two vessels speaks to either the presence of and collaboration between boatbuilding communities or local builders having expertise in multiple methods.

A more subtle example of evidence of connectivity within construction methods is that of the San Francesco del Deserto planks (Figure 5). These two sections of hull planking were found near the Venice Lagoon. They were re-used in the construction of a hydraulic system that dates to the 2nd-4th century AD (Capulli and Pelligrini 2010: 263-6). These timbers were originally identified as part of the Northwest Adriatic tradition, but the sewing channels are only 7-9mm in diameter and spaced only 2.5 to 3.5cm apart. This is much smaller and more closely spaced than is typical for Northwest Adriatic sewn boats. When co-author Staci Willis first examined these timbers, I thought that this was perhaps a boat of the Northeastern Adriatic tradition that had wrecked or been abandoned on a trip to the western coast, had

pieces of it salvaged, and then incorporated into this structure. Because we see smaller holes spaced closer together in the Northeastern Adriatic Tradition of sewn boats.



Figure 5. Photograph of one of the San Francesco del Deserto planks showing elements of the sewing system (small channels spaced close together) (Photo by M. Capulli).

Pomey and Boetto (2019: 8-17) outlined both the Northwestern and Northeastern Adriatic traditions of sewn construction in their publication of sewn-boat traditions of the whole Mediterranean. Some of the hallmarks of the Northeastern Adriatic tradition include their overall structure as keeled vessels with rounded hulls and planks generally joined together with simple overedge stitches (////)³ (Pomey and Boetto 2019: 11). In contrast, they describe the Northwestern Adriatic tradition as primarily consisting of keel-less, flat-bottomed vessels and a cross-stitch sewing pattern with clamping turns (IXIXIX) (Pomey and Boetto 2019: 16). As Pomey and Boetto argue, one of the major distinctions between the western and eastern traditions is the sewing pattern, with a cross-stitch pattern in the west and a simple overedge stitch being most common in the east. Unfortunately, the sewing pattern is not always preserved in the remains found along the northwestern coast of the Adriatic Sea. This is due to the large number of hull planks that were re-used in secondary construction elements, like the San Francesco timbers discussed here.

Instead, what is preserved is the size and spacing of the sewing channels that facilitated the sewing pattern. The Northeastern sewn tradition has sewing channels that are spaced typically about 2-4cm apart (Boetto and Radic Rossi 2017: 279-88; Boetto *et al.* 2017: 189-98; Pomey and Boetto 2019: 5-51; Radic Rossi and Boetto 2020: 263-90). The diameter of the sewing channels is not always reported for these

³ The exception to this stitching pattern will be discussed shortly.

vessels, but it was recorded at 3-4mm in the Zaton (Nin) wrecks (Brusic and Domjan 1985: 71). For other Eastern Adriatic sewn boats, the dimensions of the pegs that lock the stitching into place have been recorded as less than 1cm in diameter and are the best proxy to the size of the sewing channels themselves (Boetto *et al.* 2017: 192, 195-6; Radic Rossi and Boetto 2020: 273, 275, 277). By comparison, as stated above, the Northwestern tradition has sewing channels spaced about 5-10cm apart, with a diameter between 1-2cm on average. This comparison of the sewing systems of these two traditions is summarised in Table 2.

	Northwestern Tradition	Northeastern Tradition
Sewing Pattern	Cross-stitch pattern with clamping turns (IXIXIX)	Simple overedge stitches (///)
Diameter, Sewing Channels	1-2cm on average	Less than 1cm
Spacing, Sewing Channels	5-10cm apart	2-4cm apart

Table 2. Comparison of the Key Elements of the Sewing Systems of the Northwestern Adriatic and Northeastern Adriatic traditions of Sewn-Boat Construction.

As the remains of sewn boats from the eastern and western coasts of the Adriatic Sea have both distinct sewing patterns as well as dimensions related to the sewing channels, this is a strong indication that the size and spacing of the sewing channels is correlated to the sewing pattern itself. Thus, we recommend supplementing the work of Pomey and Boetto by including the size and spacing of the sewing channels as a key element in distinguishing these two traditions of sewn construction. Since the San Francesco del Deserto timbers found in the Venice Lagoon do not have the sewing pattern preserved, it cannot be confirmed that they are from a sewn boat of the Northeastern tradition as we originally hypothesised. However, based on new discoveries along the Croatian coast, we think it may be more complicated than just a simple east/west divide. At Pula, Croatia researchers recovered the wrecks of two sewn vessels, one of which is the Pula 1 shipwreck that consists of the remains of a small, keeled coastal trading vessel (Boetto *et al.* 2017: 279-88; Pomey and Boetto 2019: 10). Both the San Francesco timbers and the Pula 1 shipwreck seem to blend elements of both the eastern and western tradition.

Like the San Francesco planks, the Pula 1 shipwreck has small sewing channels spaced relatively close together (Boetto *et al.* 2017: 195), which is arguably a feature of the Northeastern tradition as discussed above. But it had hull planking of elm and mostly dogwood for treenails (Boetto *et al.* 2017: 195), which is identical to the materials used in the San Francesco remains and is common among Northwestern Adriatic sewn boats. Other traditional Northeastern vessels used beech for the planking and mostly olive or holm oak for treenails (Dominguez *et al.* 2021: 251-6).

We also see an elaboration of the sewing technique with the Pula 1 ship. Instead of a simple overedge stitch, the Pula 1 vessel had an overedge with clamping turn (/I/I/I) (Boetto *et al.* 2017: 279-88; Pomey

and Boetto 2019: 10). While it is not the full cross-stitch pattern seen in the Northwestern Adriatic, the presence of a clamping turn may indicate this is an intermediate sewing pattern. And perhaps these two discreet finds represent a sharing of technical processes across east and west in the upper Adriatic builders moving themselves across the region or sharing knowledge as the boats of each tradition sailed around the Adriatic Sea. A comparison of these two sewn boats remains is summarised in Table 3.

	San Francesco del Deserto	Pula 1
Sewing Pattern	Not preserved	Overedge stitch with a clamping turn (/I/I/I/I)
Diameter, Sewing Channels	Small (7mm and 9mm)	Small (less than 1cm)
Spacing, Sewing Channels	2.5-3.5cm apart	4.6cm apart
Planking Material	Elm (<i>Ulmus</i> sp.)	Elm (<i>Ulmus</i> sp.)
Treenail Material	Dogwood (<i>Cornus</i> sp.)	Dogwood (<i>Cornus</i> sp.)

Table 3. Comparison of the Pula 1 and San Francesco del Deserto Sewn Boat Remains. Features common in the Northeastern tradition are darkly shaded; features of the Northwestern tradition are lightly shaded.

Connectivity Embedded in Materials of Construction

Let's turn now to evidence of connectivity seen in the materials usage. As stated above, there is a clear trend among Northwestern Adriatic sewn boats for elm hull planking. The one exception to this so far is the Corte Cavanella II hull remains, which used a central plank of spruce and two side planks of cypress to form the bottom of this small vessel that was subsequently re-used in a docking structure around the 1st century AD (Figure 6) (Willis and Capulli 2018a: 9-13).⁴

This is the only known use of cypress in sewn ship construction in this region. The authors were also not able to confirm the use of cypress in any other style of shipbuilding during this time period in the northwestern Adriatic. Instead, it is a more common component along the Tyrrhenian coast, in particular the use of cypress for hull planking is attested in the 2nd century AD mortise and tenon ships recovered from Naples and Rome (Allevato *et al.* 2010: 2365-75; Lipschitz 2015: 617-8). The knowledge and use of cypress as a suitable wood for hull planking potentially connects the builders of these two coastlines.

And finally, the use of esparto grass (*stipa tennacissima*) for the cordage to sew up these vessels ties the Northwestern Adriatic sewn boatbuilders to the wider western Mediterranean. So far, four of the five

⁴ Wood species identified by Nili Lipschitz, Institute of Archaeology, The Botanical Laboratories, Tel Aviv University.

Northwest Adriatic sewn boats that have had their cordage identified have used esparto grass⁵ (Berti 1990: 29; Willis and Capulli 2018b: 345; Vitri *et al.* 2003: 328; Willis 2016: 142), which is native to the southern coast of Spain and the northwestern coast of North Africa.

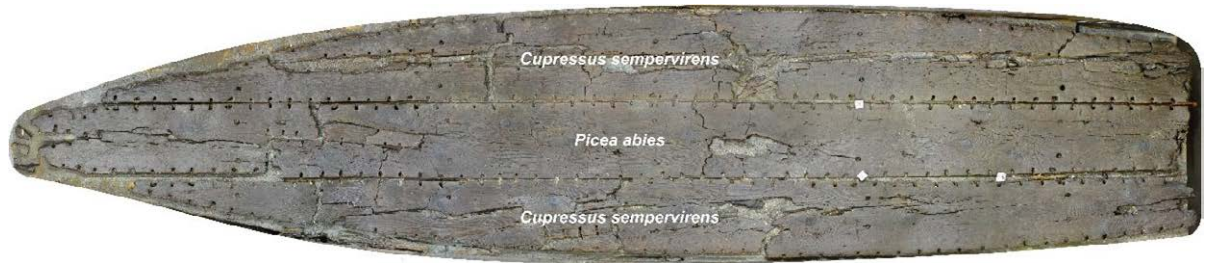


Figure 6. Photomosaic of Corte Cavanella II hull with species identification by author (Elaboration by M. Capulli).

Fibrous materials make excellent pollen traps and pollen can provide a fingerprint specific to localities and seasons of the year. An initial analysis of the seam wadding and cordage of the Stella 1 barge returned pollen spectra that were quite distinct from each other despite being from the same vessel (Willis 2017: 486-7). This strongly suggested that the pollen from the cordage at least was very likely incorporated during the manufacturing process and not after deposition of the boat. An expanded pollen study was thus conducted. Additional cordage samples from the Stella 1 barge and the Venice Lido III timbers were collected and analysed in order to explore whether this grass cordage was coming from Spain, North Africa, or manufactured locally in northern Italy from the grass raw material. The results of the extended pollen analysis indicated that the cordage was very likely manufactured in Spain then shipped to Italy (Willis 2017: 484-92).

Overall, most of the cordage samples from both the Stella 1 barge and the Venice Lido III timber assemblage compare favorably with paleoenvironmental reconstructions of southeastern Spain. The particularly significant elements of the pollen spectra that correlate to the dry or semi-arid environment of southeastern Spain are the higher frequency of Asteraceae types (including *Artemisia*), as well as higher Amaranthaceae and wild grasses. While an origin in North Africa cannot be ruled out at this time, Spain does seem the more likely candidate (Willis 2017: 489-90).

The presence of this foreign import as the element that literally held these boats together tied these builders not just to Spain but also into the broader colonial machinations of the Roman empire. A

⁵ Fiber identification of the Comacchio ship was conducted by Lanfredo Castelletti, Alfio Maspero, Sila Motella, and Mauro Rottoli, Laboratorio di Archaeobiologia dei Musei Civici di Como. Fiber identification of the Stella 1 barge was conducted by Mauro Rottoli, Laboratorio di Archeobiologia dei Musei Civici di Como and confirmed by author Willis using the resources of the Paleoethnobotany Laboratory, Texas A&M University. Fiber identification of the Venice Lido III timbers and the Canale Anfora II remains was conducted by author Willis using the resources of the Paleoethnobotany Laboratory, Texas A&M University.

Northwestern Adriatic sewn boat from the pre-colonial period has yet to be confirmed, and thus we do not know what builders of this region may have used for cordage before the conquest of Spain by Rome. But we may have an idea of what happened once those connections across the western empire started to breakdown.

Recently, the fifth-century Padovetere vessel has turned up an identification of hemp as the material used for its cordage (Beltrame and Costa 2023: 60-3). Does the absence of esparto grass on this Late Roman vessel indicate issues with importation? Was it no longer available in this region due to the broader social and political unrest of the 5th century? Is this evidence of connections across the ancient Mediterranean world faltering? Additional research is needed to confirm this hypothesis. But overall, we hope this paper has showcased how many connections across both land and sea are evidenced within the methods and materials used to construct the boats that themselves carried things and ideas.

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Coastal Landscapes, Harbours and Ports

Submerged Baiae: The Amphitrite Project and the New Underwater Investigations in the Area North of the Channel to *Baianus Lacus*

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Maria Francesca Pipere⁴, Alessandra Dell'Anna⁴

Abstract

The paper presents the preliminary results of the underwater investigations directed by the National Superintendency for Underwater Cultural Heritage (Taranto-Italy) carried out in the area north of the channel to *Baianus Lacus* in the frame of the 'Amphitrite Project: underwater archaeology for all in marine digital parks', funded by the Italian Ministry of Culture.

The investigations included analysis, cataloging, and 3D documentation of the architectonical structures related to the so-called 'Thermae of the fishes' and the 'Villa with a prothyrum entrance', buildings characterizing this area of submerged Baiae; the sector that juts out onto a peninsula of the access channel to the *Baianus Lacus*. The activities also included excavations of the villa's atrium with a prothyrum entrance. The results shed new light on the topography of Baiae from the end of the 1st century BC and the end of the 3rd - beginning of the 4th century AD.

Amphitrite Project⁵

Amphitrite Project - Underwater archaeology for all in digital underwater parks (Programming financed according to article 1, paragraphs 9 and 10, of the law of 23 December 2014, n. 190 - Stability Law 2015, YEAR 2021-2023) involves five Marine Protected Areas: Portofino (Liguria), Isole Tremiti (Puglia), Capo Testa - Punta Falcone (Sardegna), Capo Rizzuto (Calabria), Baia, Campi Flegrei (Campania).

The main general goals are:

1. To promote knowledge of underwater archaeology.

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⁵ Written by B. Davidde Petriaggi, S. Medaglia, G. Bucci, A. Dell'Anna, M.F. Pipere.

2. To create and implement mapping and census of the underwater archaeological heritage for protection and inclusion of sites through the GIS of the Ministry of Culture (ICCD, Vincoli in Rete, Risk Map, and GeoPortal for Archaeology).
3. To monitor and adopt the best solutions to protect underwater archaeological sites, including consolidation, restoration, conservation, and excavation activities on selected sites.
4. To promote underwater archaeological tourism through the creation of real and virtual itineraries in submerged and subaerial environments, extending the use, through new technologies, to various targets of visitors including the disabled.
5. Environmental monitoring, studying any environmental risks that may compromise the state of conservation using a network of innovative sensor nodes that use underwater internet technology.
6. Creation of a virtual museum.

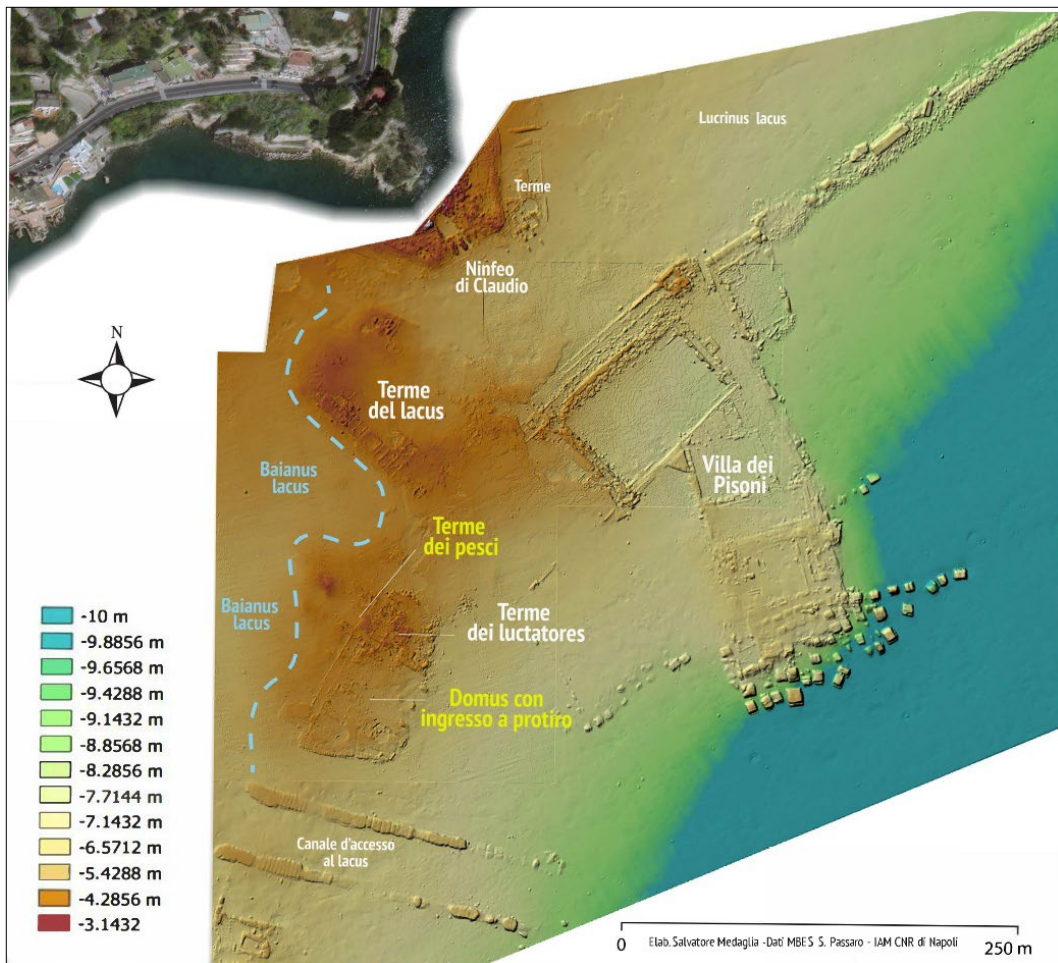


Figure 1. Plan of submerged Baiae on MBES acoustic cartography
(Elaboration by S. Medaglia; MBES data by S. Passaro IAM CNR Napoli).

Topographical Framework⁶

In Roman times there was no place that enjoyed as much fame as Baiae as a place dedicated to well-being, leisure, and *blanda voluptas* as a passage from the Latin Anthology well defines it. A thermal bath site *par excellence*, became a highly sought-after destination thanks to two natural elements mentioned by the sources until Late Antiquity: vapor and thermo-mineral water. This enchanting environmental scenario of the superb marine landscape is described by Horace (*Ep.* 1. 83), *Nullus in orbe sinus Baiis praelucet amoenis* (nothing in the world is more splendid than the pleasant gulf of Baiae). In this place, from the end of the Republic and for a great part of the Imperial age, the wealthiest and most noble members of the Roman élite, including the emperors themselves and their families, wanted to establish their residences thereby, building daring and luxurious *villae maritimae*.

What makes the archaeological context of Baiae unique in the world is a favorable natural condition, the presence of bradyseism, a geological phenomenon which brings sometimes the uplift, sometimes the sinking (and therefore the submersion) of entire sectors of the ancient settlement, today a great part of the Archaeological Park; the sinking has allowed exceptional conservation of the archaeological artifacts⁷ (Figure 1). In this context for several years, first the Central Institute for Restoration (Istituto Centrale per il Restauro ICR-Rome) and today the National Superintendence for the Underwater Cultural Heritage through the *Amphitrite project*, have been carried out, in collaboration with the Archaeological Park of Campi Flegrei, archaeological investigations and underwater restoration aimed at the rigorous reconstruction of the submerged Baiae.

In the last five years, the research has been conducted in various sectors:

- 1) *Villa of the Pisoni*
- 2) *Thermae of the Lacus*
- 3) *Thermae near Punta dell'Epitaffio* (room paved with an *opus sectile*)
- 4) *Portus Iulius - the republican villa and the building with a porticoed courtyard*
- 5) *Thermae of the Lacus* (room paved with a polychrome mosaic)
- 6) the *apodyterium* of the so-called *Baths of the wrestlers*
- 7) the so-called *Thermae of the fishes* of which the topographical study is in progress
- 8) the vast complex of the *Villa with prothyrum entrance*.

⁶ Written by B. Petriaggi Davidde.

⁷ On the underwater archaeological complex of Baiae, see the following summary contributions: Miniero 2007; Caputo 2008.

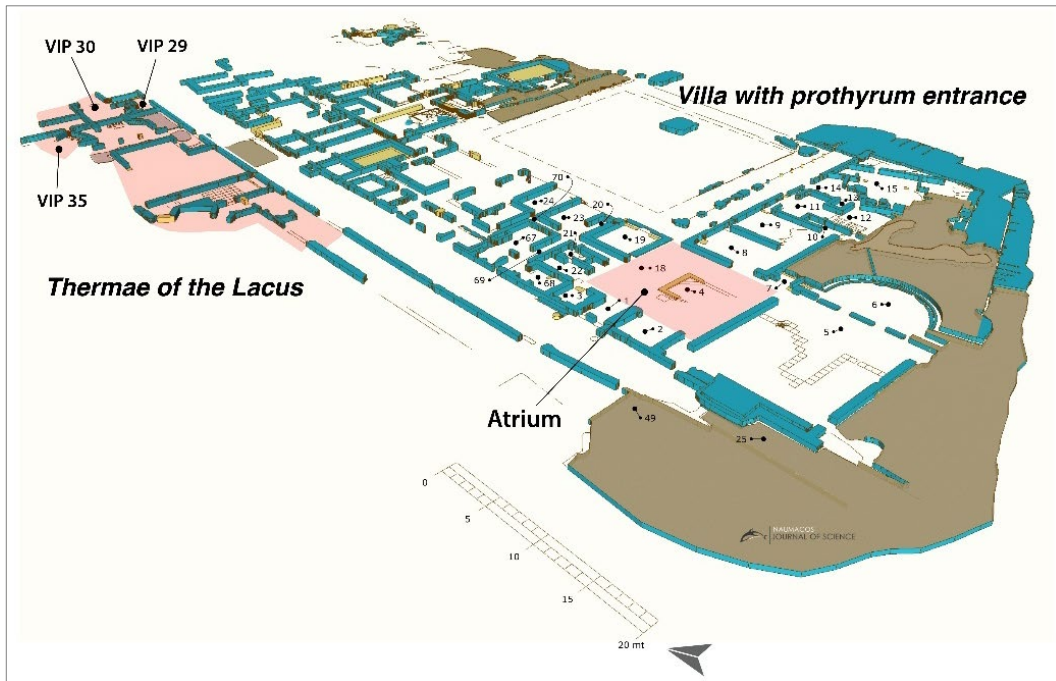


Figure 2. Oblique view of the *Villa complex with prothyrum entrance*, the so-called *Thermae of the fishes* and the *Baths of the Luctatores* from a 3D survey (Elaboration by Naumacos).

Here we will present the discoveries that emerged from these last two complexes. The campaign of June 2022 was promoted by the National Superintendence for Underwater Cultural Heritage with the direction and supervision of Barbara Davide Petriaggi and the technical direction of Salvatore Medaglia with the underwater archaeologists of the National Superintendence Giovanna Bucci, Alessandra Dell'Anna, and Maria Francesca Pipere. The team also included the underwater architect Filomena Lucci and Gabriele Gomez de Ayala in charge of the 3D surveys and video-photographic documentation.

These two architectural complexes (the so-called *Thermae of the fishes* and the *Villa with prothyrum entrance*) are located on the coastal shore which, in ancient times, separated the *Lacus Baianus* from the sea, right next to the masonry channel which guaranteed its access (Figure 2). This structure created a sort of peninsula, clearly visible on the multibeam reliefs; around it was centrally crossed by a road running NE/SW, on the western side of which there were series of *tabernae* sometimes with back shops. The so-called *Thermae of the fishes* occupied the area between the road and the lakefront, and the *Villa with prothyrum entrance* was located between the road and the sea. In this topographic framework, following the importance attributed by ancient sources, we record the presence, within a radius of a few hundred metres of at least four thermal complexes: the *Thermae of the fishes*, *Thermae of the Lacus*, *Thermae of the wrestler*, and *Thermae of the fishes* of Punta Epitaffio.⁸

⁸ About the topography of this submerged area, see Davide Petriaggi *et al.* 2020.

The So-Called Thermae of the Fishes⁹

During the first campaign of the Amphitrite Project conducted in June 2022 the surveys conducted at so-called *Thermae of the fishes* (Figure 3) were entirely functional to a preliminary cleaning, census, documentation, and monitoring of the buildings, whose precise extension is not yet known; they present structures of very articulated interpretation, and not yet chronologically exactly framed; the purpose of investigations is a punctual topographical and stratigraphic study, for possible consolidation, conservative restoration activities with the creation of new visit itineraries, open to the public, to be developed on different levels of fruition and accessibility. Here we present some preliminary considerations (for topographical location see Figure 2).

The building, very well known for the black and white mosaic with representations of fishes and aquatic birds, concerning a marine-lacustrine environment¹⁰, is probably a public complex, also given the exceptional panoramic position of the building, as described above, located between the main road axis and the lakefront. Similar to other buildings in the Phlegraean area, the structural remains show clear traces of both natural (wave motion, animal, and plant colonization, bradyseism) and anthropic refurbishments, reinforcements, collapses, demolitions, and plundering across centuries up to today.



Figure 3. The so-called *Thermae of the fishes* (Graphic elaboration by S. Medaglia; photos by M.F. Pipere, G. Bucci and A. Dell'Anna).

In the investigated sectors, in particular the eastern and central one, the complex shows walls in *opus testaceum*, sometimes with reused materials including marble, retaining traces or fragments of coverings in plaster or, in other cases, with *crustae marmoreae*; numerous attestations of renovations and spoliations, even more, evident in the floor plans which preserve the negatives traces of the *opus sectile* and of the removed thresholds, leaving the preparations of the floor plans exposed, where we see

⁹ Written by M.F. Pipere, A. Dell'Anna.

¹⁰ While this volume was in press, an article by Gallochio *et al.* 2024 on the Fish Mosaic was published; readers are referred to it for further details.

fragments of molded and decorated reused marble slabs. The northernmost rooms, which are characterised by the presence of an oven (VIP 30) approximately circular (max. external Ø: N-S 2.05m, E-W 1.90m), built in bricks and stones blocks, close to the perimeter wall of room VIP 33, and rooms with brick floors, have provided information on the functional nature of the sector and its change of use, at least in the last phase of life, probably connected to a domestic-artisan area.

Room VIP 35 Investigations¹¹

The VIP room 35 is part of a complex divided into several rooms, probably related to a thermal context heavily remodeled over time, through important structural changes, demolitions, and plundering. Ancient anthropic modifications and wave motion have meant that the remains of the structures are particularly complex to understand.¹² An area of approximately 20sqm was cleaned inside the VIP 35 compartment (for topographical location see Figure 2). The 2022 investigations focused on the evidence enclosed by three walls, bearing fragments of marble slab flooring about a further artificial plan to the west of the latter.

The stratigraphy of the sediments covering the floor structures and the user levels is partially preserved in the western sector of the investigated area. A layer with a coarse sandy matrix with breccia, clay fragments (tiles, bricks, tableware), marble, and shells covers partially the site, located at an average depth of about -3.80m. The investigations made it possible to detect 10 main US, of which nine are structural US linked to the diachronic anthropic use of the area under study. A large bracket structure made up of three walls connected (USM 1, USM 2, USM 3). The walls are made of bricks (intact and reused) bound by a gray cement mixture; in the highest area, seven courses of bricks are preserved. It is a sack masonry technique construction with external rows of aligned bricks, tangents on the short side, *emplekton* made with fragments of brick arranged flat (in the lower portion), and rubble. The facing was originally covered with *opus sectile* and subsequently plastered; very small traces of the plaster remain, while there are still clearly visible portions of the marble facing on the walls. It is not excluded that, even in ancient times, the inside of the structure was covered with *opus sectile* only in the lower part, to then be plastered only on the higher bands.¹³

The three wall units enclose a space whose more recent flooring is made up of a geometric *opus sectile* of rectangular marble slabs (module 65×23×2cm), arranged in a North-South trend, aligned on double parallel rows, alternating with single rows of pink marble strips (module 26×5×2cm). The floor is stripped and is preserved only on the east side of the U-shaped room, above a foundation made with a

¹¹ Written by G. Bucci.

¹² From the point of view of the stratigraphic studies, Room VIP 35 has been unpublished until now. Our 2022 investigations focused on the relationship between wall and floor systems, testimonies that testify the evolution of the site over the centuries with important traces for the historical-archaeological interpretation of the site.

¹³ About plaster and structure conservation: Petriaggi 2005; Petriaggi *et al.* 2008.

very compact gray cement mix, with black and white inclusions. The foundation is divided into two sections which show slightly different chromatism. The US 5 foundation rests against slabs of *opus sectile* (US 9) which cover the U-shaped structure internally, demonstrating the evident subsequent nature of the floor interventions concerning the covered walls.

Residues of wall *opus sectile* in veined white marble and gray marble (with a thickness of 1.5cm) are attested, solidly attached to the bases of the walls: it is certainly stripped. The cladding covered (at least the base of) the walls USM 1, 2, and 3, and it is also found inside channel US 6. The straight channel US 6 (length 3.50m; width 12cm, average depth 10cm) separates the structure formed by the three walls, with the relative floors, from a further flooring system made of cement mixture with clay fragments and fragments of white marble, arranged flat to form a regular level. On US 7 we can read the load marks of a floor in square tiles (module 30×30cm) completely stripped. Above this pavement there are evident traces of the impost of a probably wooden pillar relating to one of the last phases of life of these rooms, clearly legible evidence from the DTM model also with an alignment probably attributable to dividing partitions with wooden uprights (Figure 4).

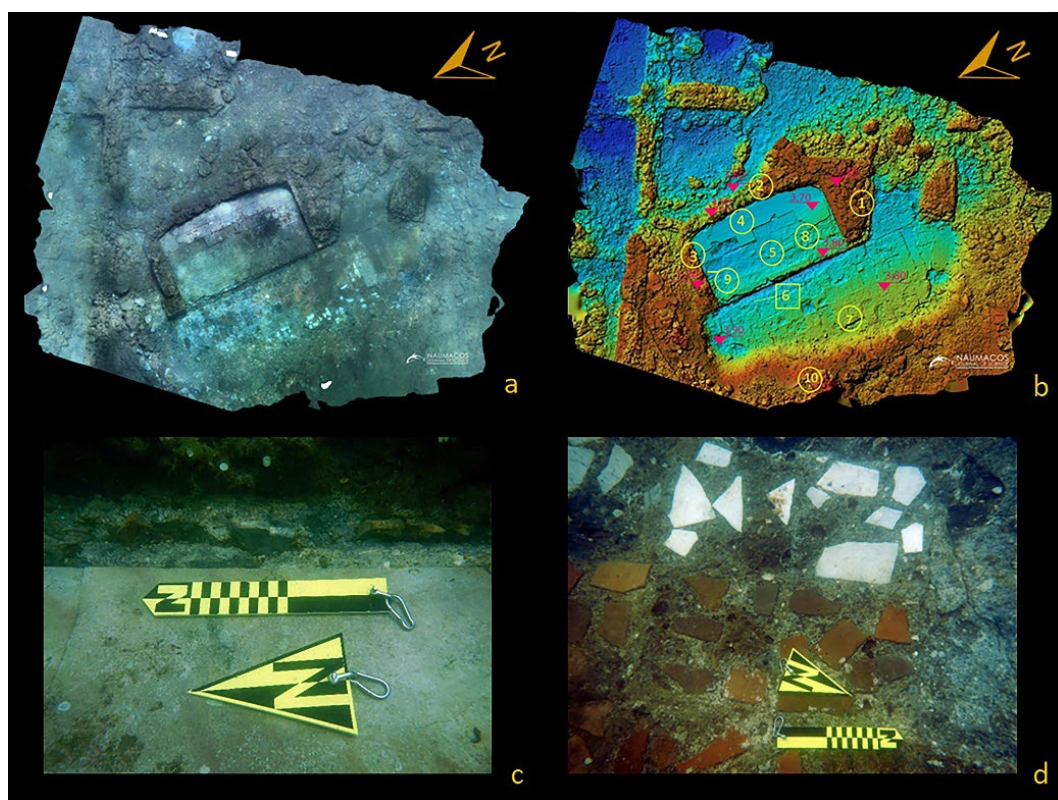


Figure 4. Room VIP 35: a) orthophoto, b) DEM with stratigraphic units, c) detail of floor US 4, and remains of parietal lining, d) floor US 7 (Orthophoto and DEM by Naumacos; photos and elaboration by G. Bucci).

The bracket wall apparatus, in the matrix, appears to belong to the most ancient phase of the complex: the building, inserted in the context of thermal structures, could perhaps have enclosed a basin, covered

in *opus sectile*, subsequently filled and paved, as indeed could have been the structure to the west of the channel. The new flooring testifies to a change of use and the decommissioning of the baths. Among the marble remains found in US 10, many fragments of floor and wall *opus sectile* are noted. Polychrome strips prevail among the wall elements. A remarkable element is a lanceolate, curved leaf, with a central groove. Outside the U-shaped room, at the northern and southern ends of USM 2, it should be noted that two prominent walls support the structure. The same type of structure is also present in the VIP 30 area. Considering the data collected in the surveys in the VIP 35 environment, it is possible to identify three main periods:

I Period. Imperial age. Rooms with thermal baths covered in *opus sectile* (walls USM 1, 2, 3, septile US 9, and possible second large tank west of channel US 6).

II Period. Late Antiquity.

Phase I. Transformation of the tanks into floor foundations (US 5 foundation) with the construction of the pink marble floor (US 8).

Phase II. New sectile pavement with rectangles and strips US 4 (+ plaster walls USM 1, 2, 3) and (to the West) foundation with clay and marble fragments US 7).

Phase III. Removal and insertion of wooden structures and supports (see the alignment of holes and projecting artifacts).

III Period. Post Antique Epoch. Stripping and demolition.

***The So-Called Villa with Prothyrum Entrance*¹⁴**

The other novelties coming from the exploration of the Baiae seabed by the National Superintendency concern the *Villa with prothyrum entrance* which extends over a total area of over 5000 square metres (Figures 1 - 'Domus con ingresso a protiro' - and 2). The name given to this complex is due to its masonry columns, with stucco facings, which supported the porch at the entrance on whose sides were placed long masonry benches covered with red plaster.¹⁵

Crossing the entrance, located on the street that crossed the entire block lengthwise through a well-preserved stone threshold, we find a short vestibulum that overlooks the cell of the *ostiarius*. Once passed the *fauces*, a rectangular *atrium* of about 14×13m opened at a lower level. In addition to a stairwell that allowed access to the upper floor, there was also a *cubiculum* whose floor was enriched by a two-tone mosaic of the 2nd century AD with pelt motifs.

¹⁴ Written by S. Medaglia.

¹⁵ On the *Villa complex with prothyrum entrance* see most recently Davidde Petriaggi *et al.* 2024. On the previous bibliography see: Di Fraia 1993: 36-7, Fig. 10; Scognoamiglio 1997: 38; Ricca *et al.* 2014.

On the eastern side of the *atrium* there was a large room (*tablinum*) whose floor still retains traces of the original *opus sectile*; from this area, there was direct access to another room behind it, also paved in *opus sectile*, and then to a series of particularly luxurious rooms, which are still waiting to be investigated. In this area, corresponding to the complex's southeastern sector, the villa's maritime quarter should perhaps be located.

A great part of the entire complex was occupied by a large peristyle courtyard. Traces of the colonnade have so far come to light on the southern, western, and northern sides. All around the portico ran externally a floor, similar to a sidewalk separating the covered ambulatory from the garden area. This predisposition allowed the *dominus* and his guests to walk inside and outside the portico. A low wall in *opus reticulatum* marked the boundary between the external sidewalk and the actual garden. The marble statue recovered in 1993 and now kept in the Archaeological Museum of the Campi Flegrei (in which a seated female figure is portrayed, on the model of the Aphrodite of the gardens of Alcamene) should be attributed to the furnishings of this garden (De Caro 1994: 665-6; Scognamiglio 1997: 39, Fig. 7; Davidde Petriaggi *et al.* 2018: 4; Davidde Petriaggi *et al.* 2024).

On the south side of the complex are the remains of a sumptuous apsidal hall oriented approximately east-west. The plan of this room, which is accessed directly from the atrium, consists of a large rectangular hall measuring about 16.5×13.5m on which an uncovered apse (10.37m wide and about 6m deep) opened on the short eastern side and ensured a scenic view. The floor of the hall was entirely covered with *opus sectile* slabs, while that of the apse space was lined with marble slabs. It has already been appropriately hypothesized that this building should not have belonged to the original phase of the complex and that, more likely, it was added at a later time. Hypothetically, this complex could have fulfilled the role of a representation room, maybe a hall intended for banquets. The temptation to compare, albeit generically, this architecture to the apsidal structures of some aristocratic *domus* of the Late Imperial Age is seductive, among which, just to give an example, the cases in Ostia should be mentioned.

The most striking news, however, comes from the stratigraphic surveys of June 2022 promoted by the National Superintendence for Underwater Cultural Heritage. During the investigations lasting about 4 weeks, a hydraulic structure with monumental features came to light in the center of the *atrium*.¹⁶ It has a rectangular shape (about 6.94×6.20m) and is built with *opus reticulatum* attesting walls of remarkable technical workmanship. The structure consisted of an outer basin lined with white marble and a central architectural nucleus – a sort of fountain – which was divided internally by a series of basins that contributed to giving the whole complex a lively geometry. This central nucleus, punctuated by floors located at different levels, just like the *lacus* perimeter, is at a different depth, provided for the simultaneous presence of basins intended to contain water and potting soil for plants which were originally perhaps adorned with plants and floral decorations. The sides of the rectangle are not all the

¹⁶ While this volume was in press, a study on the monumental fountain in the *atrium* of the Villa with a *prothyron* entrance appeared, to which the reader is referred for further details. See Davidde Petriaggi *et al.* 2025.

same: an irregularity can be noted for which perhaps structural reasons related to bradyseism can be invoked (Figure 5).

In the center, in an elevated position, the fountain shows a lozenge-shaped body with curvilinear sides; the top was lined with a marble *opus sectile* of which the negative imprints of the various elements can be seen; on the top, there must have been some furniture, probably sculptures. In contact with the vertices of the lozenge, there are four semicircular basins whose flooring is made with crafted marble slabs of different sizes. There were triangular-shaped tanks at the four vertices of the complex – and in a higher position concerning the semicircular tanks. They too were lined with marble but despite the others they were surrounded by low molded frames.

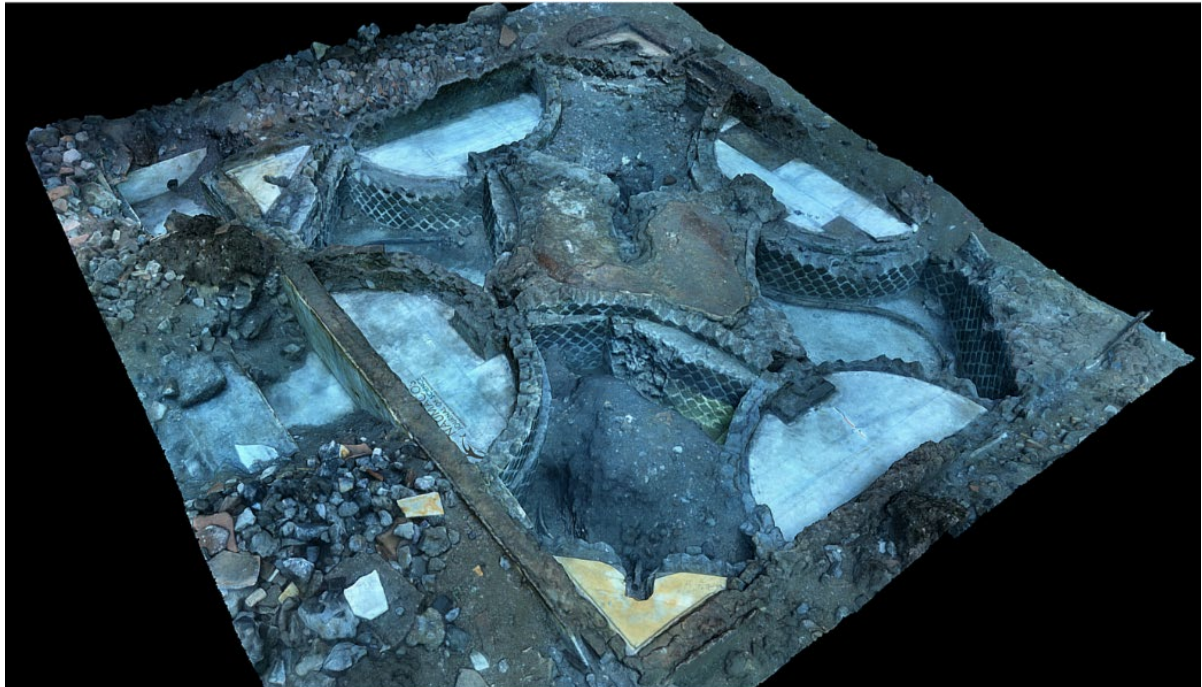


Figure 5. Atrium of the Villa with *prothyrum* entrance: oblique view of the hydraulic structure (Elaboration by Naumacos).

Plays and gushes of water were guaranteed by a particularly complex water system, obtained with the use of several metres of leaden pipes with particularly ingenious couplings and fittings. Based on the available data, it is plausible to suggest that water reached both the central lozenge-shaped structure and the four triangular corner compartments under sufficient pressure. Neither the triangular compartments nor the central platform display drainage openings, but only apertures for the passage of the pipes supplying the system. It is therefore likely that each triangular compartment produced two simultaneous jets directed towards the adjacent basins, which also received water from the central platform. This occurred through jets of varying heights, originating both from the *ornamenta* placed on the cement bases at the extremities of the lozenge, and from the central statue, the cantharus, or other features positioned at the centre of the structure.

After supplying the system, the water from the semicircular basins flowed through dedicated openings into the perimeter basin (euripus). From there, it was subsequently channeled into underground conduits, which presumably discharged into the sea.

This represents a discovery of considerable significance, shedding light not only on the *prothyrum* complex but, more generally, on the splendour of the architectural furnishings of the sumptuous residential villas of Baiae. The hydraulic complex briefly presented here remains under study.

Conclusion¹⁷

The ongoing archaeological investigation of this submerged sector of Baiae progresses steadily, marking a significant endeavour in uncovering the secrets of the past. Currently, the focus remains on multiple fronts, with studies continuing to unfold. Among the key pursuits is the excavation of the *apodytherium* of the so-called *Baths of the Wrestlers*, a task that promises to be very interesting for the understanding of the relationship between this room and the rest of the architectural complex and also in the hope of finding the missing part of the mosaic. Furthermore, efforts extend beyond mere excavation.

The meticulous completion of the archaeological and risk classification of the entire area north of the channel to *Baianus Lacus* stands as a pivotal objective. It underscores the necessity of understanding not just the historical significance but also the contemporary challenges and hazards that may affect the preservation and exploration of this submerged landscape. Yet, the true depth of understanding lies in the thorough examination of the architectural complexes submerged beneath the waters. Through the intricate study of masonry stratigraphies, a comprehensive diachronic narrative begins to emerge, painting a vivid picture of the evolution and societal dynamics of this submerged Baiae sector across epochs.

In essence, it is through these multifaceted endeavours that we endeavour to unravel the mysteries concealed beneath the waves, offering glimpses into a bygone era and enriching our understanding of the past while navigating the complexities of preservation and exploration in the present day.

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Paleolandscape Dynamics of San Bartolomeo Bay (Italy–Slovenia): Geomorphological and Archaeological Evidence from the Sea-Cliff–Shore-Platform Transition Zone

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Abstract

The San Bartolomeo/Sv Jernej Bay represents a key case study for investigating the long-term evolution of coastal landscapes through the integration of geomorphological and archaeological data. This study aims to reconstruct the paleolandscape of the bay by combining geomorphological data, and analysis of coastal landforms with archaeological evidence of human occupation and land use during Roman Age. Field surveys and Remote Sensing (RS) data were used to identify inherited and active geomorphic features, while archaeological records provided insights into past coastal use together with information about sea-level changes. Archaeological data, including the spatial distribution and chronological framework of structures and artifacts, were analysed to study the human occupation and human–environment interaction.

The integrated approach allowed the identification of former shoreline positions, and areas of anthropogenic modification within the natural landscape, highlighting the role of both natural processes and human activities in shaping the bay through time. The results contribute to a refined reconstruction of the bay paleolandscape and demonstrate the importance a multidisciplinary approach for understanding coastal evolution, cultural heritage preservation, and the resilience of coastal systems to environmental change.

Introduction

Coastal landscapes represent highly dynamic environments where the interaction between marine processes, terrestrial dynamics, and human activities has produced complex and rapidly evolving landforms over multiple temporal scales (Kennedy *et al.* 2014). Reconstructing past coastal scenery is

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therefore essential for understanding long-term geomorphic evolution, human–environment relationships, and the resilience of coastal systems to natural and anthropogenic forcing (Benjamin *et al.* 2017). In this context, the integration of geomorphological and archaeological data has emerged as a particularly effective approach for paleolandscape reconstruction, as it allows natural processes and human presence to be interpreted within a shared spatial and chronological framework. Several authors deepen these relations in the Mediterranean area (e.g. Auriemma and Solinas 2009; Benjamin *et al.* 2017).

The Mediterranean region offers an exceptional setting for such interdisciplinary investigations. Its rocky coasts have been shaped by the combined effects of tectonic activity, sea-level fluctuations, wave action, and weathering processes, while simultaneously hosting millennia of human occupation. Archaeological remains preserved within coastal settings often provide precise chronological markers that complement geomorphological evidence, enabling more robust reconstructions of past shorelines, coastal landforms, and environmental conditions (Auriemma and Solinas 2009). Conversely, geomorphological analyses help to contextualize archaeological sites within evolving landscapes, shedding light on the environmental constraints and opportunities that influenced settlement patterns, resource exploitation, and coastal use through time.

San Bartolomeo Bay constitutes a particularly suitable case study for exploring these interactions. The bay is characterised by a complex rocky coastal morphology, shaped by structural controls, marine erosion, and sedimentary processes, and by the presence of Roman Age archaeological remains. Its geomorphic setting, combined with well-preserved cultural evidence, provides a valuable opportunity to investigate the co-evolution of natural coastal dynamics and human activities. Despite its significance, however, a comprehensive reconstruction of the bay's paleolandscape through both geomorphological and archaeological perspectives has only been partially investigated (Antonioli *et al.* 2007; Furlani *et al.* 2023).

Previous studies in similar coastal contexts have demonstrated that isolated disciplinary approaches may overlook key aspects of landscape evolution, either by underestimating the role of human modification or by inadequately accounting for long-term geomorphic change (e.g. Foresta Martin and Furlani 2019). An integrated methodology is therefore required to capture the full complexity of coastal paleolandscapes. Such an approach is particularly relevant in light of ongoing and future environmental changes, as understanding past responses to sea-level variations and coastal dynamics can inform current strategies for coastal management and heritage preservation.

This paper aims to reconstruct the paleolandscape of San Bartolomeo Bay through the systematic integration of geomorphological and archaeological data. By combining detailed geomorphological data, field-based observations, UAV (Uncrewed Aerial Vehicle) data, EGMS (European Ground Motion Service) data, and the analysis of coastal landforms with archaeological evidence of human occupation, the study seeks to identify the link between natural submerged shore platform and anthropogenic structures. The results provide new insights into the long-term evolution of the bay and highlight the

value of interdisciplinary approaches for advancing geoarchaeological research in coastal environments.



Figure 1. Location of the study area.

Study Area

The study area is located in the Gulf of Trieste, the northernmost part of the Adriatic Sea, in the Mediterranean Sea (Figure 1). The study site is located at the border between Italy and Slovenia. The surveyed coastline is about 5km long and incorporates the sea cliffs of the promontory of Debeli Rtič (in Italian: Punta Grossa) in Slovenia and Punta Sottile in Italy. The first one is most natural, while the second one is occupied by a coastal road.

The Debeli Rtič promontory is a Natural Monument, with high amenity value whereby it is frequently visited by locals and tourists throughout the year. The promontory is characterised by elevations that vary in the range between 10m and 30m a.s.l., while the cliffs of Punta Sottile are lower. In a few high-tilted stretches, the sea cliff is completely devoid of vegetation, whereas in other sectors trees and brushes cover large areas of the slope face. Along the entire coastline, a strip of vegetation covers the extremity of the upper terrace of the promontory continuing up to the cliff crest (Figure 1). At Punta Sottile, some buildings have been built above the cliffs.

From a geological viewpoint, the study area is characterised by an alternation of marlstones and sandstones of the Flysch of Trieste Formation, Eocene in age (Jurkovšek *et al.* 2016). The study site is in a larger area characterised by a Dinaric thrust system that includes thrusts, reverse faults and anticline folds with a prevailing NW–SE trend (Placer 2005).

The climate of the study area is Mediterranean (Class C of the Köppen classification: Köppen 1931). Mean annual near-surface temperature in Trieste is approximately 16°C (Tommasini, 1979). The area is characterised by a prevalence of winds blowing from the first quadrant, mainly from the ENE (referred to locally as the Bora) (Carrera *et al.* 1995). South-easterly winds are important because of a longer geographical fetch (over 800km). Tides are semi-diurnal, with mean spring-tide values of 0.86m in Trieste, and mean neap-tide values of 0.22m (Raichich and Colucci 2019). The concomitance of spring tides, seiches, south-easterly winds and low atmospheric pressure can cause a sea-level rise of 1.80m. Mean significant wave height during the year is lower than 0.5m (Dal Cin and Simeoni 1994), while the highest offshore wave height, both for Bora and Scirocco storms, is approximately 5 m (Cavaleri *et al.* 1996).

Materials and Methods

The investigations at the San Bartolomeo Bay have been developed by adopting a multidisciplinary approach, which incorporated desk-based activities, and field activities, including UAV surveys, bathymetric data and GNSS surveys. Preliminary activities focussed on desk-based activities. Investigation of the study site was performed via the collection of UAV-images. To produce point clouds and 3D models, these images were collocated and processed using the Digital Processing (DP) technique. These DP-derived outputs were subsequently used to analyse morphometric parameters of the study area. The UAV used in this study are relatively inexpensive devices that are widely available.

UAV Survey

Survey of the shore platform and sea cliffs at Debeli Rtič and the submerged shore platform at Punta Sottile allowed to map the present-day coastline of the San Bartolomeo coastal area, as shown in Figure 2. The UAVs survey was carried out in order to obtain information on the morphological features of cliffs and shore platforms, in areas that were deemed inaccessible and did not allow for the safe collection of geomorphological data. UAV surveys were performed with two different drones that can be categorized as micro drones, according to the drone classification developed by Brooke-Holland (2012).

Eight UAV surveys and four UAV surveys were performed on June 27, 2022 and December 16, 2025, respectively using DJI Spark drone, Conversely, the DJI Mini Mavic 2 was used for two surveys in January 2022. These micro drones offer key benefits for their low weights, relatively low cost, and good

manoeuvrability. These characteristics make micro drones a valuable tool for data acquisition in the areas with limited access of Punta Sottile and Debeli Rtič.

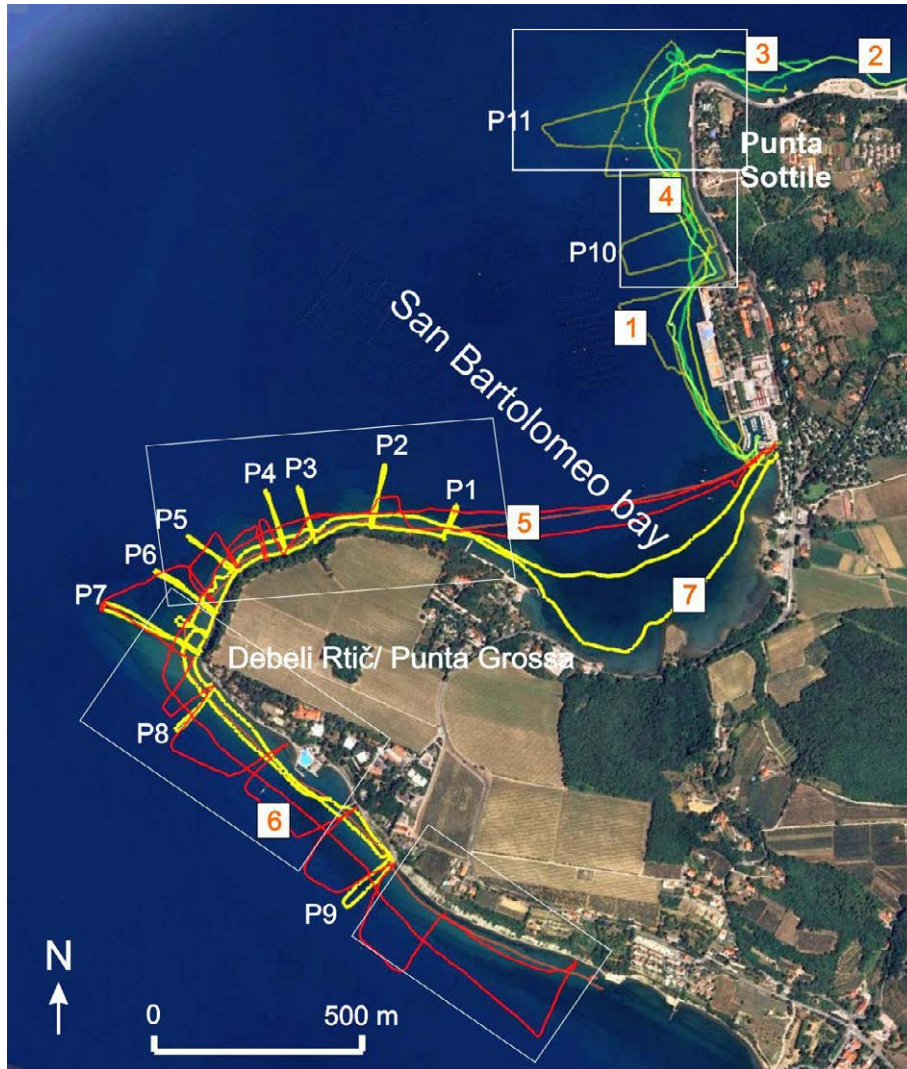


Figure 2. Map of the bathymetric tracks acquired during the kayak survey. P1-9 represent the profiles described in the text and in the Figure 5, while the red numbers are the tracks followed during the surveys. The white rectangles are the areas covered with UAV surveys.

Bathymetric Survey

Bathymetric data acquisition was conducted using the Garmin ECHOMAP 5, an integrated hydrographic system combining GNSS positioning and single-beam echo sounding technology. The instrument operates at dual frequencies (typically 77/200kHz), enabling optimised depth detection across variable substrate conditions and water column properties. During survey operations, the transducer was mounted on a rigid pole to minimize motion-induced artifacts and ensure consistent beam geometry.

Geographic positioning was obtained through the internal high-sensitivity GPS receiver, providing sub-metre accuracy under optimal satellite coverage. Depth measurements were recorded in real time and referenced to the instantaneous water surface, with subsequent corrections applied for water level fluctuations where required. Survey transects were designed along parallel and perpendicular profiles to maximize spatial coverage and bathymetric resolution.

Data logging was performed in proprietary format and later exported for post-processing and interpolation within a GIS environment using the Sonar TRX (x64) software. Acoustic returns were filtered to remove spurious signals caused by suspended sediments, vegetation, or thermocline interference. Sound velocity assumptions were based on standard freshwater profiles, introducing minimal systematic uncertainty in shallow environments. The system's CHIRP capability enhanced target discrimination and improved bottom detection reliability. Calibration procedures included draft measurement and verification of depth consistency over known control points.

The resulting dataset allowed to provide high-resolution bathymetric data and to model the submerged shore platform. Overall, the Garmin ECHOMAP 7 proved to be a reliable and cost-effective solution for small-scale hydrographic surveys.

Results

UAV Data

The areas investigated by UAV survey carried out on January 2022 along coasts of the San Bartolomeo Bay in order to map the submerged shore platforms between Debeli Rtič and Punta Sottile are reported in the white boxes in Figure 2. In addition, aerial images acquired in June 2022 and December 2025 were used to produce several 3D models and orthomosaics of sea cliffs of Debeli Rtič (Figure 3a). These 3D models are crucial to obtain quantitative information on the structure, orientation and properties of discontinuities that characterize the western and southern part of Debeli Rtič Promontory. These models can be also used to analyse and classify possible landslide types that can affect Debeli Rtič cliffs, as reported by Furlani *et al.* (2022).

Bathymetric Data

Seven bathymetric tracks were acquired between Punta Sottile and Debeli Rtič for a total amount of 26.4km. Data collected allowed to obtain bathymetric information on the submerged shore platforms at Debeli Rtič and Punta Sottile. The profiles highlight the morphometric structure of the submerged shore platform. Analysis of bathymetric tracks has shown that the shore platform is very extensive at the two promontories, where depths decrease to more than ten metres from the shore towards the open sea.



Figure 3. The coastal landscape and archaeological remains at San Bartolomeo Bay: a) UAV-DP derived 3D model of Debeli Rtič sea cliffs; b) submerged shore platform at Punta Sottile. The sandstone blocks were mistaken for artificial ones because of their regularity; c) the submerged Roman Age dock at Punta Sottile; d) The submerged slide at the northern side of Punta Sottile; e) the submerged breakwater at Debeli Rtič; f) the Roman Age fishpond at San Bartolomeo Bay.

The analysis of the profiles from 1 to 6 (Figures 2 and 4) showed that the submerged shore platform extends offshore for about 100 metres, to a depth of about 6-7 metres. Only at profile 7 (Figure 2), the westernmost sector, does it extend further, reaching a distance of almost 300 metres from the

promontory. On the contrary, on the southern side of the Debeli Rtič promontory, the shore platform deepens more rapidly and its extension is reduced to about 70m.

Profiles 10 and 11 (Figure 2 and 4), at Punta Sottile, show that the submerged shore platform is also extensive here. In particular, profile 11 shows an extension comparable to the maximum at Debeli Rtič, precisely at the promontory of Punta Sottile.

Analysis of the tracks highlights some man-made structures, which are also evident from analysis of the images and videos collected underwater. In particular, the larger structures, such as the submerged breakwater northwest of Debeli Rtič, the fishpond in San Bartolomeo Bay, and the submerged piers at Punta Sottile. Many blocks of sandstone detached from the outcrops on the seabed are also evident.

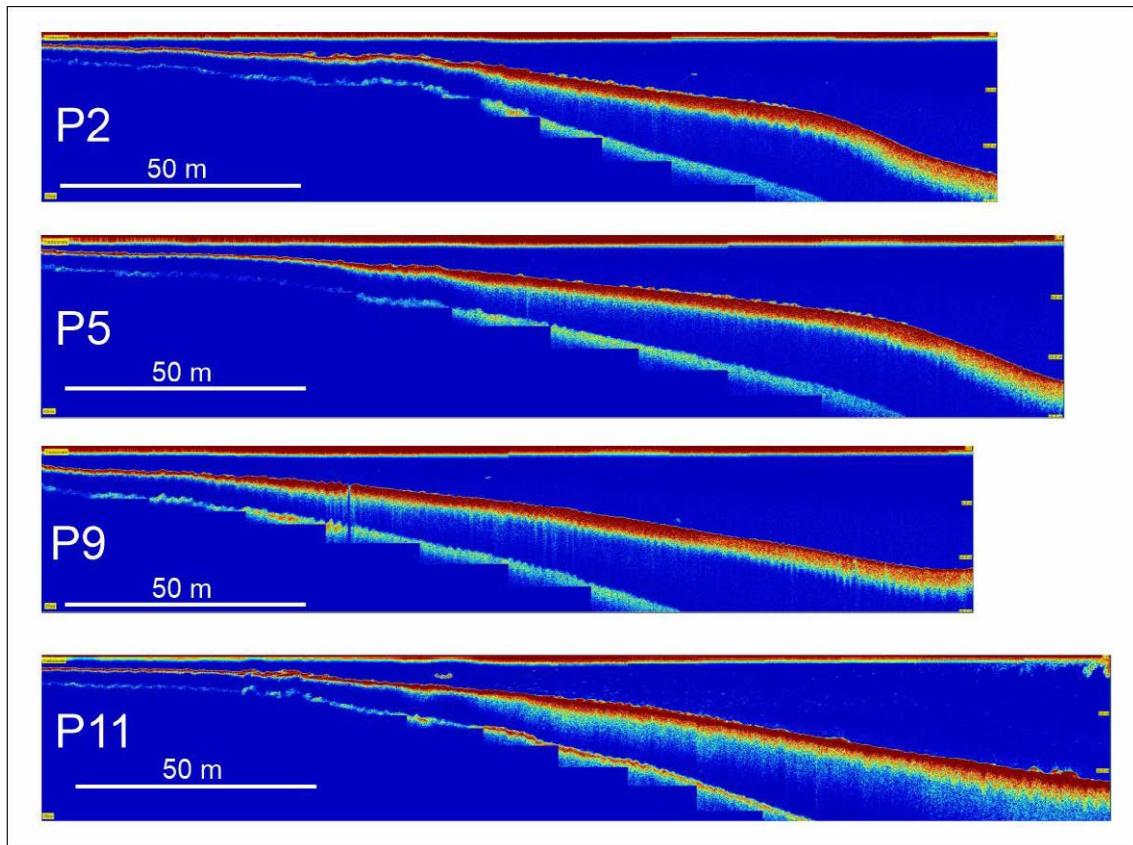


Figure 4. Some examples of bathymetric profiles acquired at Punta Sottile and Debeli Rtič.

EGMS Data

EGMS (European Ground Motion Service) is a pioneering continental-scale application of InSAR (Interferometric Synthetic Aperture Radar) technology, providing free, millimetre-precision measurements of ground deformation across Europe's Copernicus Participating States. Based on full-resolution processing of ESA (European Space Agency) mission Sentinel-1 imagery, EGMS integrates the

most advanced radar remote sensing methodologies, refined through high-quality GNSS-based geodetic referencing to ensure accurate, consistent, and cross-border comparable results (Costantini *et al.* 2021).

Among the available outputs, the calibrated products are the dataset selected for this study, as they provide a comprehensive overview of the overall tectonic behavior of the investigated area, making them particularly suitable for large-scale geodynamic analysis. Based on the last dataset available on-line from 2019 to 2023, the 5565 natural reflectors over the study area recorded on average a subsidence rate of 1.6 mm/year on the ascending dataset and 2.4 mm/year on the descending (Figure 5).

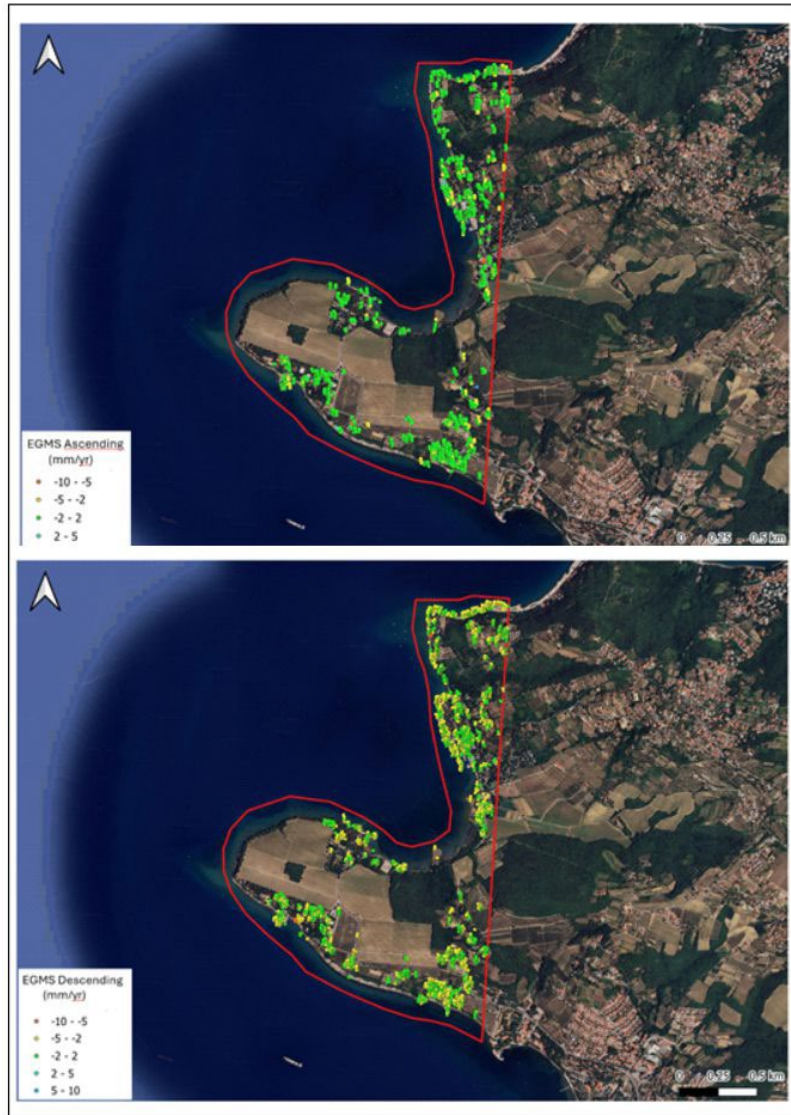


Figure 5. EGMS calibrated outputs over the study area for the period (2019-2023).

Archaeological Data

At the northern side of Punta Sottile, there is a sequence of blocks placed on a sloping surface, first reported by Auriemma *et al.* (2003). Auriemma *et al.* (2007) suggest that this may be a slipway or a *squero* (Figure 3d and 6a). A little further south is a pier identified by Gobet (1983) located 50 metres from the

shore at an average depth of 1.5m (Figure 3c and 6b). The cleaning and surveying carried out in 2005 by the Interreg AltoAdriatico project made it possible to determine the type and building technique of this structure. A little further south, within the same project, a previously unreported alignment of about ten metres was found (Figure 6c), while it was also determined that a submerged stone platform, previously interpreted by some scholars as a Roman pavement, is in fact a natural formation (Figure 3b).

Inside the bay, well protected from the prevailing winds, are the so-called ‘molere’, structures on the side of a small peninsula known as Carigador (Figure 6d), probably used during Roman times as a landing stage for a sandstone quarry behind it. The structure and characteristics of these archaeological remains and the nearby fishponds (Figure 6e) have been reconstructed in detail using multibeam surveys (Stokin *et al.* 2007).

Completing the overview of the ancient man-made structures at Debeli Rtič is a breakwater parallel to the coast, probably built to protect the cliff behind it (Figure 6f). Although the age of these structures is unknown, they could still be a Classical-period breakwater. Another small alignment is present on the shore platform that extends near Debeli Rtič. However, no pottery or other material has ever been found on the point, probably due to its highly exposed nature to erosion processes.

Discussion and Conclusions

UAV-derived topographic models and bathymetric data indicate that the evolution of San Bartolomeo Bay has been predominantly controlled by long-term marine and subaerial processes and, to a lesser extent, by human activity. Within this geomorphological framework, archaeological evidence demonstrates that Roman occupation developed in close interaction with a dynamically evolving coastal landscape.

Archaeological remains lay on the submerged shore platform. It develops on sub-horizontal Eocene Flysch (Middle–Upper Lutetian), a relatively erodible lithology that favours cliff formation and the development of an extensive wave-cut platform (Furlani 2003). The gentle north-eastern dip of the strata (300/5) and the abundance of bedding planes and fractures strongly influence erosional dynamics. Estimated cliff retreat rates of approximately 10^{-2} m yr⁻¹ suggest slow but continuous coastal recession.

The current offshore position of the Roman docking structures, located about 50m from the present cliff toe, must be interpreted within the combined framework of cliff retreat and relative sea-level change since antiquity. During the Roman period, Mediterranean relative sea level is generally considered to have been 1.6m lower than nowadays (Antonioli *et al.* 2007; Furlani *et al.* 2011), with local deviations on the order of decimetres, depending on regional tectonic behaviour. In tectonically subsiding sectors of the northern Adriatic, available geoarchaeological indicators suggest similar behaviour during the late Holocene. Therefore, the present submersion of parts of the shore platform

and the offshore displacement of the docking structures are related both to progressive cliff retreat and relative sea-level rise driven by tectonic subsidence.

The active shore platform today lies at the mean tide level and can be completely submerged during high spring tide. Several sandstone outcrops occur far below the present mean low spring tidal level and represent relict sectors formed under earlier shoreline positions. These submerged surfaces likely correspond to former equilibrium phases during the mid-late Holocene sea-level rise. The active and relict platforms thus constitute a continuous morphological archive of relative sea-level adjustments. However, it is not possible to obtain reliable information on sea levels prior to the Roman period, as there are no older markers of sea level change.

From a geoarchaeological perspective, the Roman exploitation of this coastal sector appears to have taken place during a phase, perhaps very brief, of relative shoreline stability, when the active platform was lower and the cliff toe located further seaward. The docking structures were probably constructed at the interface between the ramp and the low-tide platform surface, optimising access to shallow-draft vessels while benefiting from the natural morphological shelter provided by the platform geometry. Relative sea-level rise over the last two millennia would have altered water depths across the platform surface, progressively shifting the functional shoreline landwards and reducing the efficiency of installations originally designed for a slightly different tidal frame.

Importantly, the visual resemblance between horizontally bedded sandstone blocks and an anthropogenic pavement ('Roman pavement') must be evaluated in light of these long-term sea-level adjustments. Features currently interpreted as submerged structural elements may in some cases represent natural bedding-plane detachments that were already present - and possibly exposed - before Roman times. Distinguishing between constructional features and geomorphologically conditioned block arrangements therefore requires careful correlation between elevation data, tidal reference levels, and reconstructed archaeological sea-level positions.

Biological colonisation and hydrodynamic regime further influence the preservation and visibility of archaeological remains. The platform surface, largely below mean sea level except during specific tidal phases, is colonised by seagrass (e.g. *Cymodocea nodosa*) and encrusting organisms. These biological agents may both protect and erode rock surfaces, affecting the long-term integrity of archaeological structures. Changes in relative sea level since antiquity would have modified ecological zonation across the platform, potentially altering bioerosion intensity through time and contributing to differential preservation patterns.

Modern anthropogenic intervention, particularly the construction of a coastal road along Punta Sottile, has partially stabilised the cliff-platform system and obscured morphological evidence of ongoing retreat. This recent modification contrasts with the dynamic coastal configuration that characterised the Roman period, when human occupation was embedded within an actively evolving shoreline subject to gradual sea-level change and cliff recession.

The geomorphological and archaeological evidence together suggest that the Roman installations at San Bartolomeo Bay should be understood as adaptive responses to a specific late Holocene coastal configuration. The shore platform functions as a stratified geomorphological record of relative sea-level oscillations, erosional processes, and human coastal use.

Recognising this integrated system is essential not only for reconstructing ancient shoreline positions but also for informing future management strategies. Protection of the site would preserve a rare example of the long-term interplay between coastal morphodynamics, relative sea-level change, and Roman maritime infrastructure, rather than reducing it to a simplified and static archaeological landscape.



Figure 6. The geoarchaeological map shows the integration of natural and ancient human-made structures in the San Bartolomeo bay: a) Roman Age pier on the north side of Punta Sottile; b) Roman Age pier on the western side of Punta Sottile; c) alignment of stones probably dating back to Roman Age; d) ‘molere’ at San Bartolomeo Bay; e) fishpond at San Bartolomeo Bay; f) submerged breakwater of uncertain age.

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A Multidisciplinary Approach to Underwater Cultural Heritage: Case Study from the Venice Lagoon

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Abstract

Underwater Cultural Heritage (UCH) sites are fragile and non-renewable common resources having scientific, historical, ecological, educational, and recreational values. However, the knowledge of UCH is still very limited since the UCH sites are submerged or buried under the seafloor, thus generally hard to identify and study, and difficult to preserve and rarely accessible to the public. Global sea level rise, consequences of climate change and ecosystem degradation due to human activities are threatening the future conservation of UCH sites. At the same time in the long term, these resources could be destroyed. Coastal, transitional and lagoon environments, in particular, offer a variety of submerged cultural archaeological sites, given that humankind has populated these areas for millennia for their high productivity. However, it is very difficult to investigate these important archaeological resources because these environments are often characterised by strong currents, heavy silt suspension and very low visibility.

In this contribution, we show how high resolution multibeam echosounder and sub-bottom profiler data together with selective video inspections and *in situ* samples, not only can be of help to reconstruct the paleoenvironments, but it also can provide new evidence of the presence of archaeological structures both over and within the seafloor. We focused on a case study in the northern and central Lagoon of Venice (Italy). The new data collected show how the use of geophysical methods conjugated with *in situ* inspections, geological, archeological and archive research can be a starting point for a renovated effort of discovering, documenting, and preserving the highly valuable UCH in the Venice Lagoon.

Introduction

The origins and evolution of the Venetian lagoon have for several decades represented a multidisciplinary field of investigation, requiring knowledge not only of geomorphological and environmental data (Madricardo and Donnici 2014), but also of elements pertinent both to human frequentation and settlement (Canal 2013), and to the changes that have occurred even in very recent times due to natural and anthropogenic causes (D'Alpaos 2010a; 2010b). Indeed, the dynamics associated

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with relative sea level changes can be verified in the stratigraphic levels underground, as well as in submerged or buried archaeological remains and in manuscript documents. These data can require different methods of investigation - geophysical surveys, geo-morphological and micropaleontological analyses, archaeological excavations, archival and cartographic research, digital representation etc. (Bassani *et al.* 2022).

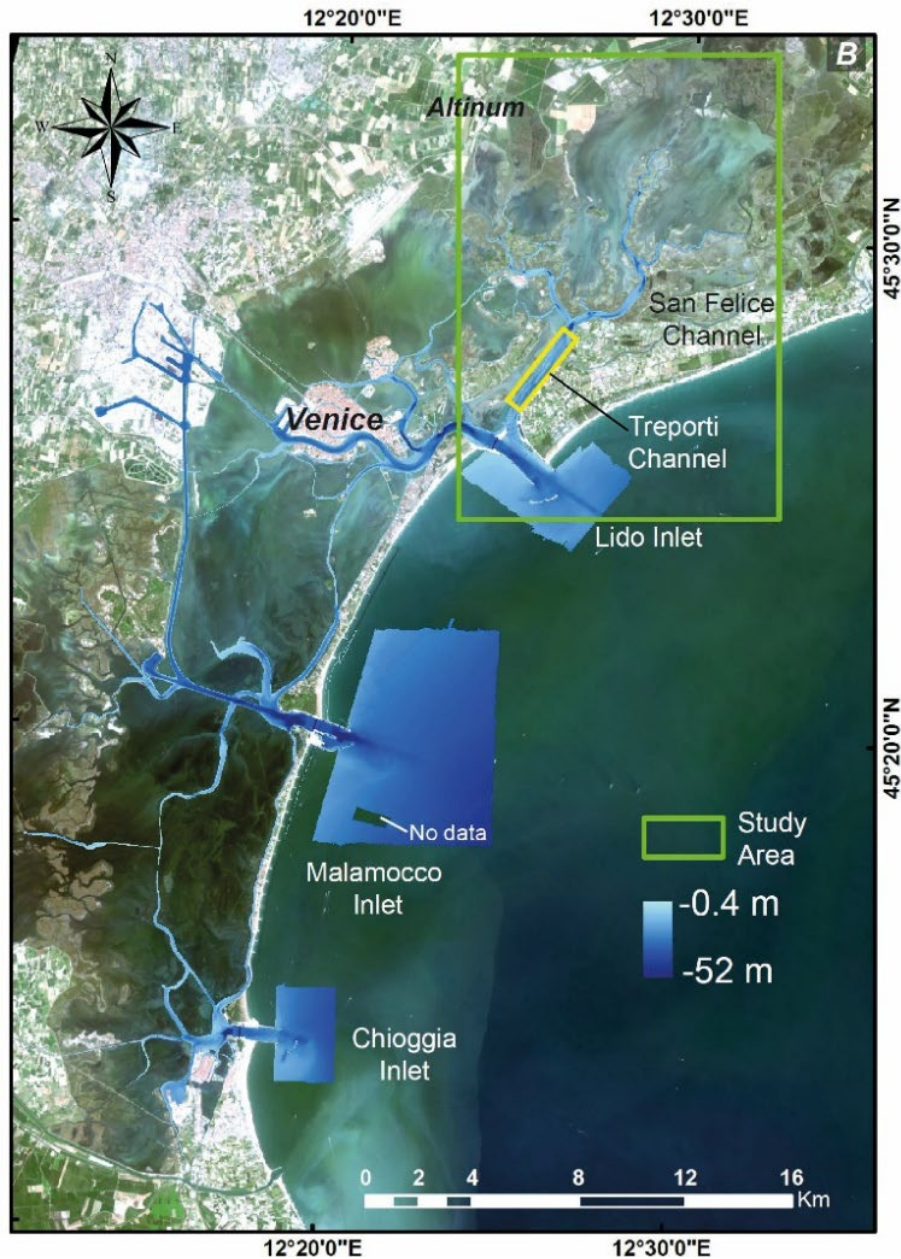


Figure 1. The Venice Lagoon and the study area of the Treporti Channel.

The reconstruction of the historical and hydrogeological setting, through the interdisciplinary approach by the institutions involved, will need underwater archaeological verification. At the same

time, it will also allow the possible identification of other anomalies of potential archaeological and historical interest. The case study we propose pertains to the Treporti Channel seabed, where some structures that have already been reported by independent scholars (Canal 2013: 259, Pl. 113.2b) are now only marginally visible since because they either lie on the seafloor of a high traffic turbid channel or they are buried under layers of sediment. Thanks to the high resolution multibeam echosounder mapping, we reconsidered those structures from a wider perspective, within an interdisciplinary approach to reconstruct the evolution of the Venice lagoon.³



Figure 2. The CNR-ISMAR vessel Litus, above, mounting the multibeam echosounder system Kongsberg EM2040DC used for the morphobathymetric survey, on the right.



The Treporti Channel Structures

Part of the area of Treporti Channel in the northern lagoon (Figure 1) in Roman times possibly corresponded to an emerged shoreline separating the lagoon and the sea and represents an interesting case study for interdisciplinary research by multiple institutions (CNR-ISMAR of Venice, Iuav University of Venice, CNR-IGG of Padua). On the bottom of the channel, in fact, there are some submerged and partly buried alignments of lithic elements that have been mapped with a high resolution morphobathymetric survey (Figures 1-3). These structures were first discovered in the 1980s by Ernesto Canal. Then, an in-depth investigation commissioned by the Venice Superintendence, described in a report dated 1985, now in the archives of the Venice Superintendence, confirmed the presence of a

³ For the results of our research, see (Madricardo *et al.* 2021).

structure characterised by multiple lytic elements, which seemed to indicate, by morphology and disposition, the shape of an ancient road. We could analyze the report's results in order to verify the previous dataset and to compare it with new elements. The 1985 investigation described one structure about 70m long and 30m wide.

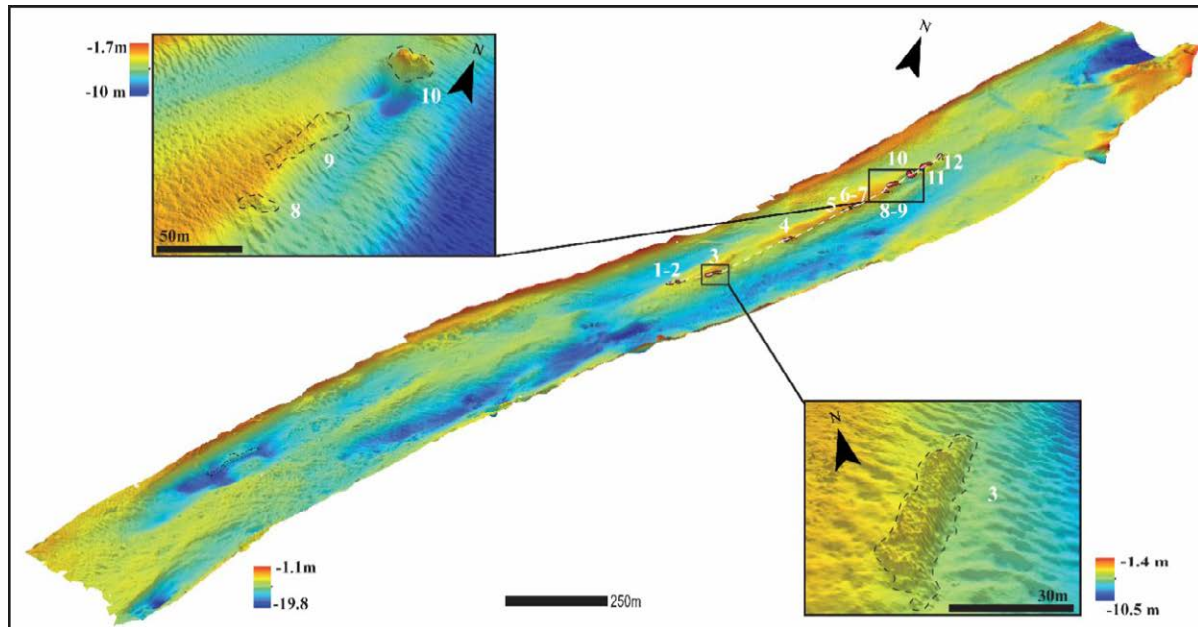


Figure 3. The bathymetry of the Treporti channel and the alignment of structures.

The high-resolution mapping carried out in 2013, however, identified not only the structure described in 1985, but a total of 12 main scattered morphological reliefs disposed along an alignment of about 1.2km (Figure 3, features 1-12). Specifically, the 2013 mapping re-identified the structure investigated in 1985 (Figure 3, features 8-9), showed that the latter was not continuous anymore showing a degradation of the archaeological structure possibly due to local erosive or sedimentation processes induced by the currents and the boat traffic waves. Sedimentation has sometimes buried anthropogenic features that could be of archaeological interest. To understand better this environment new cores were collected in the area to understand the geomorphological evolution of the area. During the 1985 investigation, some stones were collected for specific petrographic analysis (Figure 4).

The stones were recently analysed again by Lorenzo Lazzarini (2022) formerly professor of petrography in the Iuav University of Venice: they correspond to flyschoid sandstone stones, a type of rock that could date back to Roman times because it was used for walls, bridges and infrastructures in the *Altinum municipium*.⁴ Thanks to comparisons and further analysis, we think they were possibly pertinent to an

⁴ Many examples of sandstone blocks (so called 'basoli') are attested in the *Altinum municipium* during the 1st century BC-1st century AD: see (Bassani 2023) in (Madrìcardo *et al.* 2023), with specific bibliographical references.

ancient road layout and/or infrastructure for walkway/shore protection, as already hypothesized in previous studies (Furlanetto 2004: 185; Canal 2013: 259, Pl. 113.2b).



Figure 4. The flagstones of the Treporti channel collected in the 1985 inspection.

A high resolution sub-bottom profiler survey (Figure 5) showed the presence of several reflectors close to the targets attested in the previous report that could indicate the existence of other remains buried in the sediment along the seabed, i.e. the ancient shoreline. Moreover, it is important to stress that the tidal channels are highly dynamical features. Repeated morphobathymetric surveys carried out in 2013 and 2021 in the Treporti Channel highlighted that some areas of the channel underwent a process of relevant sediment deposition (up to 40cm in 8 years; Figure 6).

Emblematic in this sense is the case of an anthropogenic feature detected by CNR-ISMAR in 2013 on the seabed of the Treporti Channel (an artefact? a boat?) (Figure 6), that at that time was found to be lying at about 9m depth: in 2021, it was no longer detected by echosounder not because it was destroyed, but most likely because it was completely buried. The disappearance from the seafloor of this probable artifact, whose chronology is completely unknown, is probably to be related to the phenomenon of silting caused by marine sand input from the Lido Inlet into the recently modified lagoon to support the mobile barriers for the protection of Venice from high water (MOSE).

Should future investigations and a targeted archaeological excavation confirm that the structures found by Canal in 1979, by the Soprintendenza's divers in 1985 and now re-analysed by us with the multibeam

belong to a road-like walkway, it must be admitted that it must have been an integral part of the Roman road network in north-eastern Italy, along the coastline connecting Chioggia (ancient *Clodia*) to Altino, at the northern edge of the Lagoon. The transport system, in fact, was not limited to land routes, as the imperial control of the territory also extended to transitional environments such as deltas, marshes and lagoons; furthermore, a capillary network of waterways was used for the exchange of goods and the movement of people, in particular that system of *fossae per transversum* which Pliny the Elder speaks extensively about precisely for the Venetian lagoons (*Naturalis Historia*, 3. 119-121).

This would confirm the Roman ability to adapt to and manage complex dynamic environments, often radically different from those of today. During the Roman age, in fact, large areas of the Venetian Lagoon, that are now submerged, were emerged and accessible from land. However, despite the many finds in recent decades in the islands and wetlands of the Lagoon, the extent of human occupation in this area is still unclear.

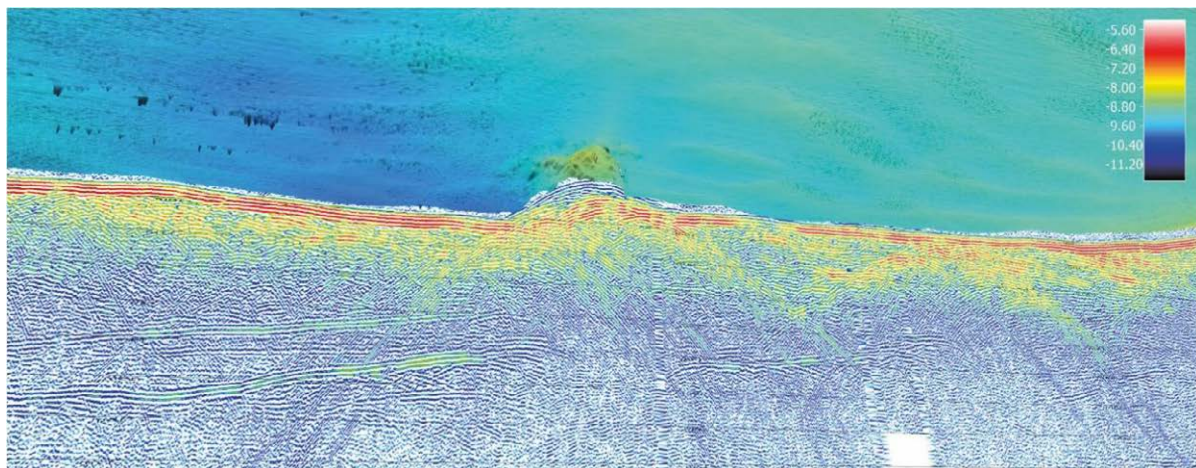


Figure 5. 3D visualization of the bathymetry and subbottom profiler data in the Treporti channel.

Conclusion

Certainly, the human presence must have been manifold and varied, as attested by the archaeological discoveries at Treporti, including the Roman villa and cistern at Lio Piccolo (Canal 2013; Goti Vola 2019; Calaon and Cottica 2020), as well as the various known road embankments at San Felice (Fozzati and Toniolo 1998) and in other parts of the lagoon: for instance, at Torcello (De Min 2006; Fozzati 2014; Calaon *et al.* 2014) and Mazzorbo (Asta and Medas 2022), or at Jesolo (Gelichi 2023).

It is therefore necessary to have a methodological perspective aimed at rereading the data that emerged from the first surveys carried out in the lagoon both in the past centuries and in the second half of the twentieth century and then reconsidering them in the light of the information deduced from new technologies and new study methods. This makes it possible to rediscover, document and preserve archaeological remains in a submerged or buried coastal landscape that may be threatened by human-induced changes or by the relative average rise in sea level. Indeed, the fate of the Lagoon of Venice, its

origin and geological evolution have always been closely linked to the relative rise in average sea level, which today threatens the very existence of the historic city and lagoon island.

Interesting prospects for knowledge, preservation, protection and enhancement of ancient remains in the Venetian lagoon and the history of settlements over the centuries are emerging, thanks to fruitful teamwork between different disciplinary fields. Our study shows how the multidisciplinary approach can improve the knowledge about known and unknown archaeological remains lying on or within the coastal environment seafloor.

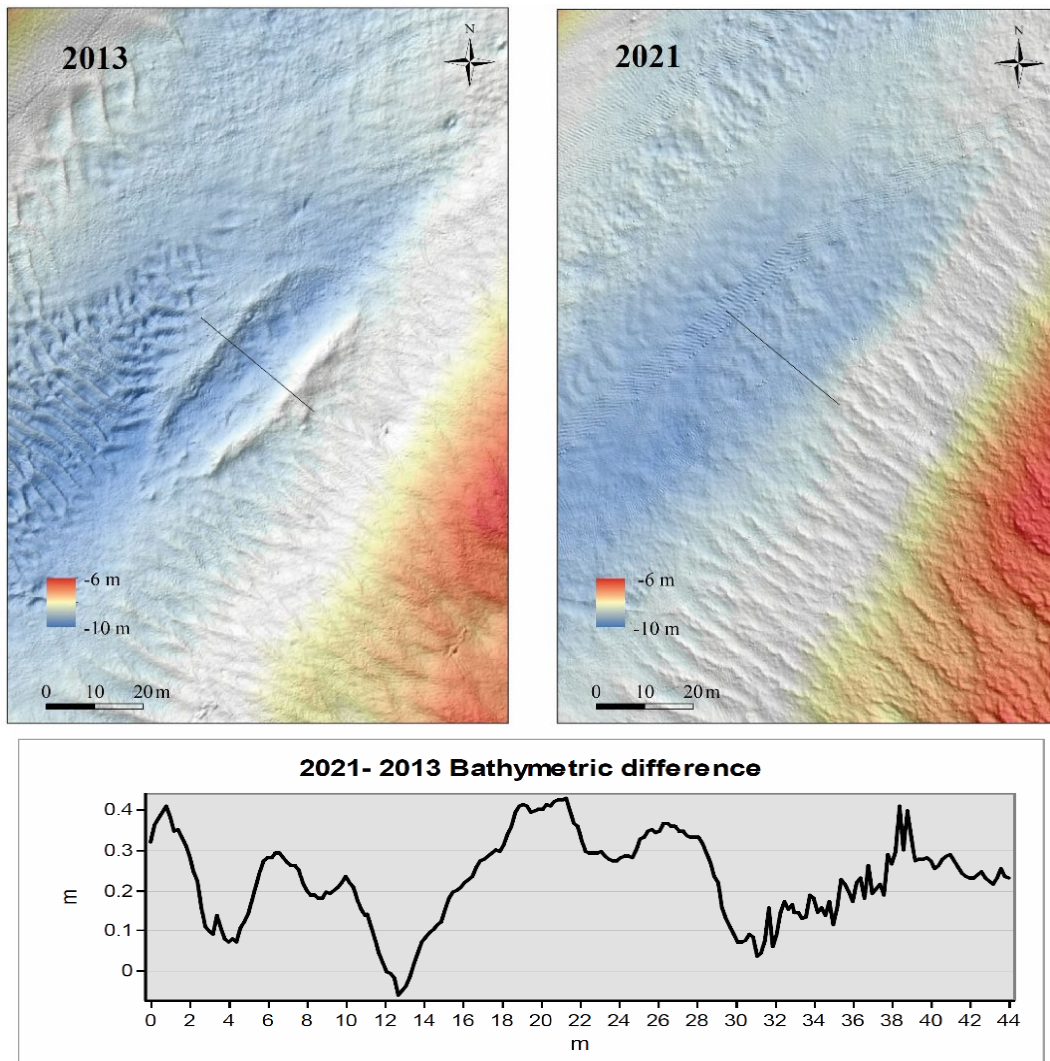


Figure 6. The bathymetric data of an area of the Treporti Channel close to the alignment of structures (cf. Figure 3) collected in 2013 (right) and 2021 (left), respectively, highlighting the presence of a target in 2013 that is completely absent in 2021. Below: the profile of the bathymetric difference extracted along a transect (black line) showing the sedimentation process.

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Three Unknown Ports from the Mediterranean

Hakan Öniz¹, Ceyda Öztosun²

Abstract

Akdeniz University has been conducting underwater archaeological research along Türkiye's Mediterranean coast for over 20 years. To date, in addition to the 422 documented shipwrecks, numerous other shipwrecks, partially submerged structures, and ancient harbours have been discovered. Most of these structures were submerged as a result of earthquakes, while others were submerged due to rising sea levels during the Holocene epoch. Some are located on the coasts of large ancient cities that are already known. However, some remain undiscovered because they are located within urban areas or because their above-ground sections are camouflaged by natural cover or because their locations have changed due to erosion.

This article will discuss three of these unknown structures: Demre Beymelek Lake – Hellenistic Port Ruins; Alanya/Okurcalar – Justinianopolis Harbour; and Silifke-Taşucu-Holmoi (Akçakıl) Harbour. These three ports have each been subject to different geographical factors, and each contains significant archaeological information.

Introduction

There are more ancient ports and anchorages than expected along the entire Mediterranean coast of Türkiye, from East to West. The number of shipwrecks documented by Akdeniz University on these coasts in the last 11 years has been 364. Almost all of these shipwrecks, located in Mersin and Antalya, are at depths of 30 metres or less. Moreover, it is difficult to say that even 10% of these coasts have been studied. So many ships sailed, traded, and sometimes joined sea battles on these shores, or hid there during storms. Almost all of the ancient cities on the coast were established either in areas with natural harbours or in places that can be reached from the sea via rivers, such as Perge and Aspendos. Therefore, every cape, every bay, and every island in the Mediterranean has been used as a port or anchorage by sailors for thousands of years. How many of the ports used on the Mediterranean Coast since the Bronze Age were celebrated? We can encounter large port cities, most of which we know are still under excavation. These are important ports known to those who are interested in the main issues of these cities.

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Figure 1. Map of the ports cited in the text.

If we start from the west in Antalya, the Harbour of Patara (Figure 1), which brought scientific results from the sand through the magnificent excavations by Prof Dr Havva İşkan Işık, is the first port that comes to mind. Andriake is another important harbour, the port of Myra. This city was one of the three powers of the Lycian Union with six voting rights (Bean 1997: 125). Andriake is considered an international trade center in the ancient period due to the shape of its coast and safe shelter for ships (Çevik 2010: 55). Known to exist in the Hellenistic and Roman Imperial Periods, Myra, one of the most populous and richest cities of Lycia in the 1st century, and its port Andriake are mostly famous for Saint Nicholas (Çevik *et al.* 2014: 226-7). Especially during the Roman Period, ports in both the Patara and Andriake regions where sailors could stay comfortably were formed due to their location being protected from major storms. The captain of a merchant ship moving north from Andriake, if the weather is not blowing from the north, can easily anchor in front of Olympos and transfer his cargo to the small boats approaching the shore.

Excavations continue here under the direction of Associate Professor Gökçen Kurtuluş Öztaşkın. Ships may anchor there and enter one of the trade ports in the north or west of Phaselis. If the wind is blowing from the north, it can unload its cargo at the breakwater in the south of the western port. Excavations in Phaselis are carried out under the direction of Prof Dr Murat Arslan, and especially in the last two years, very important structures have been restored. The captain of a ship heading north from Phaselis may want to stop at Kemer-Idyros and anchor on the way, especially if there is a storm coming from the north - one of the two dominant storms of the region. Idyros port is a safe harbour in northern storms and partially safe in eastern storms. Excavations were started here under the chairmanship of Antalya Museum Director Mustafa Demirel and the scientific consultancy of Dr Ceyda Öztosun. The captain of a ship sailing from Kemer-Idyros may want to stop at the bowl-shaped harbour of Attalea in Antalya. Although there have been some changes in the breakwater walls, Attalea was open to western winds in the Roman period as it is today, and storms blowing from this direction sank the ships in the harbour several times a year. A month before this article was written, two tour boats sank for this reason. Rescue excavations of the Antalya Museum in the city, which have yielded good results, continue. Since the ship

that we assume was sailing during the Roman period was a trade ship, it would stop at major ports while carrying goods from the West to the East. Next is the ancient port of Lara-Karpuzkaldıran-Magydos. Giant stone blocks documented during underwater research on the Mediterranean Coast were used in the construction of breakwaters to protect the harbour against southern winds. Clean water carried from the branches of the Düden stream through terracotta water pipes was supplied to the ships docking at this harbour breakwater.

The captain of our merchant ship may have anchored in front of the Kestros (Aksu) stream to sell goods to Perge and even moved inland for a while. Afterwards, he might enter Euromedon (Köprüçay) to sell to Aspendos. He would probably also purchase wine and olive oil in Pamphylian amphorae from here. Excavations are being carried out in Aspendos under the direction of Assoc Prof Dr Mustafa Bilgin, and the harbour baths on the riverside are also examined in this context. From here, the captain would take his ship to an important trade center, Side. The main port of Side is bowl-shaped and open to the western winds but closed to other winds. Depending on the weather, ships can also anchor in the north-west or east of the Side peninsula. The Side excavation is carried out by Prof Dr Feriştah Alanyalı. Continuing to sail eastward, the ship would pass the ports of Okurcalar/Justinianopolis and Fuğla-Ptolemaios, both of which are man-made, reaching the front of Alanya Castle, namely Korakesium. Excavations are being carried out under the direction of Prof Dr Osman Eravşar in this harbour open to the east winds. From here, the ship continues towards Gazipaşa and passes by the ports of Siedra, Iotape and Selinus and reaches the port of Antiochea Ad Cragum. This port is very open to west winds and is not very safe. As a result many shipwrecks have been documented in and around it. Excavations of this ancient city are carried out by Prof Dr Michael Hoff.

The ship, which continued its journey from the westernmost point of Antalya to the East, undoubtedly did not stop at many known ports. Information available from ancient and modern sources shows that there may be as many as 60 ancient ports on the Antalya coast. However, the location of most of them is unknown, and it is unclear whether they still exist. For Mersin, this number is 38. Studies carried out uninterruptedly on these shores since 1999 show that the numbers in question may be correct. The number to be reached with the addition of natural harbours is even higher. The sailor who captained a merchant ship in the Roman period undoubtedly knew these harbours better than us, and his journey from west to east probably took weeks. On this route, Anemurium, the first major port west of Mersin, would be the first port of call. The ancient city, located in the eastern part of Anamur cape, is one of the rare Anatolian ancient cities with almost all its structures standing (Tekocak 2019: 522). The breakwater blocks that make up the harbour are under the water and partly under the sandy bottom of the sea. Another port worth visiting on the journey east would be the ancient city of Kelenderis. This city was one of the important port cities of ancient times. (Zoroğlu *et al.* 2019: 547). Excavations in this city, which has an ancient harbour protected from almost all winds, were carried out by Assoc Prof Dr Mahmut Aydın. Afterward, the captain, who might envisage some possible needs of his ship on Dana Island, one of the world's largest ancient shipyards, in Silifke, must have stopped by Elaiussa Sebaste, the most important production center of Cilician Type 6b, LR1b amphorae. The ancient city, which is 55km away

from Mersin on the Silifke-Mersin road, stands out for its production potential of agricultural products. Excavation has been carried out by Prof Dr Annalisa Polosa since 2014 (Kızıllarslanoğlu 2019: 54).

One of the most beautiful ports of the Mediterranean is undoubtedly Soloi-Pompeipolis. The captain who passed by this magnificent harbour on his way to the east would of course put his ship into this harbour as well. Soli, a partially intact man-made port in the Mezitli district of Mersin province, also had a 450-metre-long port street that divides the city into two in the middle. Excavations of the city were carried out by Prof Dr Remzi Yağcı (Yağcı and Kaya 2012: 169). The ship's journey would undoubtedly continue first to Tarsus, then to Magarsus (Karataş) and Aigea (Yumurtalık) on the Adana Coast and then onward to the Hatay Coast. Afterwards, it is not possible to know which ports he may have sailed to, where he visited, or where he ended his life. However, as is written on the sarcophagus of the Olympian captain Eudamos: 'Because there is no help from wind or sunlight anymore, after leaving the light-bearing dawn, Captain Eudamos buried there his short-lived ship like the day, like a broken wave...'.

The ports we mentioned above are the most important and well-known ports of Antalya and Mersin. Of course, many more ports have not survived to this day or are not yet discovered. What other ports might the captain of the Roman Period Merchant Ship have called at? In this part of the article, some ports that are not well known and have been partially clarified through studies conducted in recent years will be discussed. For this purpose, a Lycian Port (Ision); Justinianopolis, a port located on the Pamphylia-Rough Cilicia border; and a Rough Cilician Port (Holmoi) were examined.

Demre Beymelek Lake - Hellenistic Port Ruins

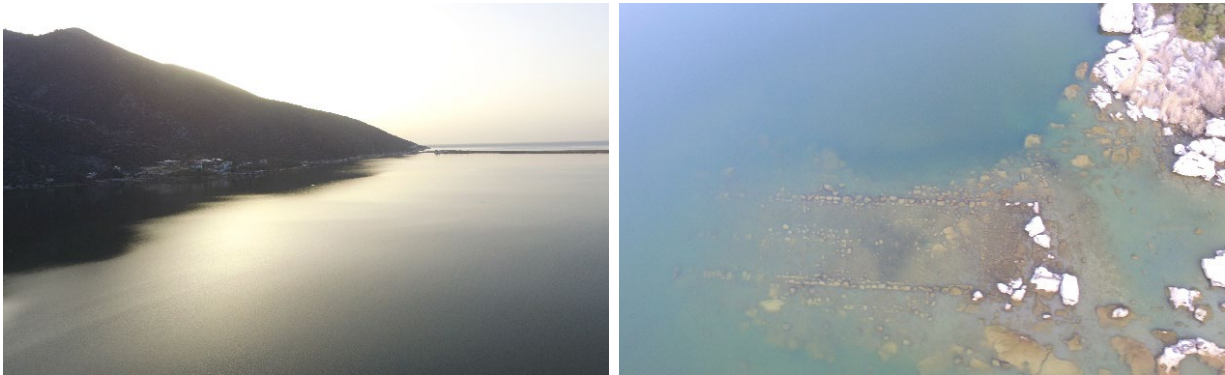


Figure 2. Left, Beymelek Lake from land to the sea entrance. Right, Beymelek Hellenistic Breakwater (Photos by Gunay Donmez).

Beymelek Lake is a semi-salty lagoon connected to the sea by a small channel in the Demre District of Antalya (Figure 2, left). The closest archaeological site is approximately 1250m from the lake. Ision is located in the north-northwest direction, approximately 190 metres above the lake. The closest ancient city to Lake Beymelek is Myra. Today, the distance between this city and the lake is 5km. Geomorphology

studies conducted in the Demre Stream delta revealed that Lake Beymelek consisted of a bay on the seashore 3000-2000 years ago (Öner 2011; 2013). Beymelek Lagoon, currently located in the eastern part of the Demre Plain, is separated from the sea by a long coastal bar. A breakwater structure was found during underwater research in Beymelek Lake. The visible remains of a completely submerged breakwater lie in the form of a row of stone blocks. Its deepest point is 2.2m. The breakwater lies 0.4m beneath the surface and is approximately 40m long and 8m wide (Figure 2, right).

The stone blocks used in its construction are similar to the building materials used in Ision, and most blocks look specially processed. With these features, this breakwater structure, which can be dated to the Hellenistic Period, closes the southern gap of the bowl-shaped natural bay coming from the sea, forming a safe harbour. Thus, the harbour, which was closed to the winds that could come from the seaward part of Beymelek Bay in the first millennium BC, gained a medium-sized form with dimensions of approximately 170x120m. Some stone blocks in the form of a breakwater were probably destroyed by an earthquake (Öniz 2016). This port, which was used by Ision, must also have served Myra.

Alanya/Okurcalar - Justinianopolis Harbor



Figure 3. Justinianopolis Port (Photo by Hakan Öniz).

During the studies carried out in the ancient city of Justinianopolis in the town of Okurcalar, the submerged stone pier/dock structure of the city was found (Figures 3 and 4). Justinianopolis is 40km away from Alanya and is located between the Alanya-Antalya highway and the seashore.

The center of the city in the Roman period was founded on a hill on the coast, and the harbour form is located in the western part of a peninsula. It is possible to see city walls, tombs, structures, and aqueducts in the city. The city was named after the Byzantine emperor Justinian (Ramsay 1890). A small island directly across from the city served as a natural breakwater and safe anchorage was possible in the city except for from the south-west and south-east winds. The stone dock structure that was found must have been used to load the city's commercial products, especially olive oil, onto ships.

During the studies carried out to complete the documentation of the sunken dock structure, work carried out on the small island opposite the ruins revealed that the island was used as a quarry for stone blocks and later as a salt collection pool in ancient times (Figure 5).

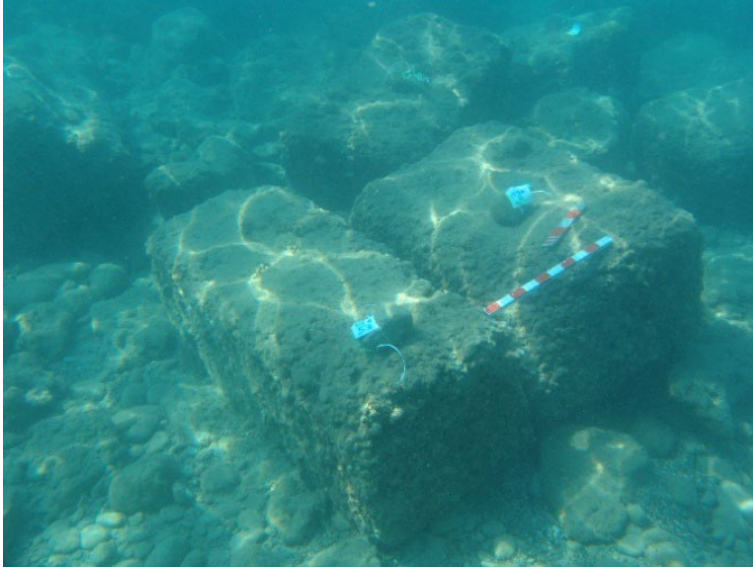


Figure 4 (above) and Figure 5 (below).
Justinianopolis sunken port
(Photo by Hakan Öniz).

Investigations show that the pier/dock structures of the ancient city were cut off from the island, pools were created in the bedrock during this removal, and these pools were used to collect salt (Figure 6). There are also rock-cut rooms on the island where salt is stored.



Figure 6. Justinianpolis Quarry - Salt Island (Drone Photo by Ercan Soydan).

Silifke-Taşucu- Holmoi (Akçakıl) Harbuor

During underwater studies off the coast of Mersin, a completely submerged breakwater and an associated harbour structure were documented in Akçakıl, located west of Taşucu, Silifke (Figure 7). This breakwater structure, located to the east of a small peninsula approximately 4km west of Taşucu, must belong to the ancient city of Holmoi (Öniz and Karademir 2018). It is stated that Holmoi, a port city in Rough Cilicia, was located between today's Silifke and Taşucu (Ünal 2006: 76). In the work of the ancient writer Strabo, it is stated that during the establishment of Seleukeia, Seleucus I. Nikator (312-281 BC) settled the Holmoi people in Seleukeia. The port probably remained inactive after this date. All of the ruins of the breakwater, which resemble a wall, are located approximately 1-3 metres underwater. Ancient ruins, amorphous ceramic pieces, and amphoras buried under modern buildings were also identified in the area. The port area is operated as a tourist camp today.



Figure 7. Holmoi sunken breakwater (Drone Photo Gunay Dönmez).

Conclusion

Neither human life nor books would suffice to examine the hundreds of ports along the Mediterranean coast and turn them into publications. However, shedding light on the past, understanding the lives of tens of thousands of sailors, and accessing even the smallest piece of information about their history are among the beautiful things in the world. The knowledge gained through the science of archaeology, which provides us with this opportunity, carries a special value. The discovery of archaeological remains at depths inaccessible to most people holds a special place in this context.

The three ancient ports discussed in this article, Demre Beymelek Lake - Hellenistic Port Remains, Alanya/Okurcalar - Justinianopolis Port, and Silifke-Taşucu-Holmoi (Akçakıl) Port, have been exposed to different geographical factors and each contains important archaeological information. It is not difficult to imagine the stories each port was part of in the past and the thoughts of sailors searching for them during storms. Existing documents indicate that future excavations in these areas have great archaeological potential.

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Seascape Archaeology of the Harbour of Constantinople around Küçükçekmece Lagoon: The Perception and Conceptualization of the Sea

Błażej M. Stanisławski¹

Abstract

One element of the port system in Constantinople during the Late Antique and Medieval periods was the port complex around Küçükçekmece Lagoon. This included the ports of Angurina, Rhegion, Firuzköy Peninsula and Schiza. These ports were the focus of research conducted from a ‘seascape archaeology’ perspective. This approach was based on settlement sources, archaeological data, cartographic sources and toponymic data.

During the interpretation phase, we attempted to clarify the meaning of the recorded spring structures within the settlement, natural and symbolic spheres, and their function within the religious sphere. These structures represent the interaction between imagination, cultural practices and religious beliefs, and reflect how this space is perceived and conceptualised, particularly with regard to the landscape and water bodies. Our interpretation is based on assumptions developed in cognitive anthropology and archaeology. According to cognitive science, culture is a symbolic system that bears close resemblance to the language system. It is a set of models for perceiving, associating with, and interpreting the world.

The structure identified in the analysed source data reflects the concept of ‘seascape thinking’, which illustrates how people at that time perceived the natural environment, particularly water and the sea, as well as the meanings and threats associated with it, and the activities and relationships of people with the sea and the Creator. This concept formed the basis for actions aimed at imposing order on nature, transforming it and shaping the real landscape into a symbolic one.

We attempted to interpret the meaning of the above structures within the framework of metaphors relating to ships, navigation, and the perception of the sea, as presented in early Christian texts created in regions with which the community of the examined port complex had maritime connections.

Discussion

For many years the standard work on the ports of Constantinople was W. Müller-Wiener’s ‘Die Häfen von Byzantion-Konstantinopolis-Istanbul’ (1994). Conclusions based mainly on written sources and, to some extent, on the still partially preserved Julian harbour and the imperial harbour of Bukoleon, as

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well as on the relatively few archaeological sources known at the time, led to the following findings Constantinople had five main harbours, two of which were legacies of the Greek period, namely the harbours of *Bosphorion* and *Neorion* in the bay of the Golden Horn, and the harbours built later on the Marmara coast, namely the harbours of Leo/Zophia, Theodosius and the imperial harbour of *Bukoleon*. The real breakthrough came when excavations began in the Yenikapı district of Istanbul. As a result of the large-scale excavations carried out over many years, large areas of Theodosius' harbour were uncovered, 38 perfectly preserved wrecks of various types of Late Antique and Byzantine boats, ships and vessels, as well as many of antiquities (Kiziltan 2010; Kocabaş 2010; 2012; Kocabaş, Özsaıt Kocabaş 2012; Kocabaş *et al.* 2016). These sources have been systematically collected and published. They now form the basis of studies on the material culture of the community of Late Antique and Byzantine Constantinople. This subject has also been developed internationally in a work entitled 'Die Byzantinischen Häfen Konstantinopels', edited by F. Daim (2016), where it has been extended to the question of the smaller ports of the capital located on its periphery, such as the ports of the suburb of *Hebdomon*, the ports of the district of St. Mamas and Hierapolis on the Bosphorus².

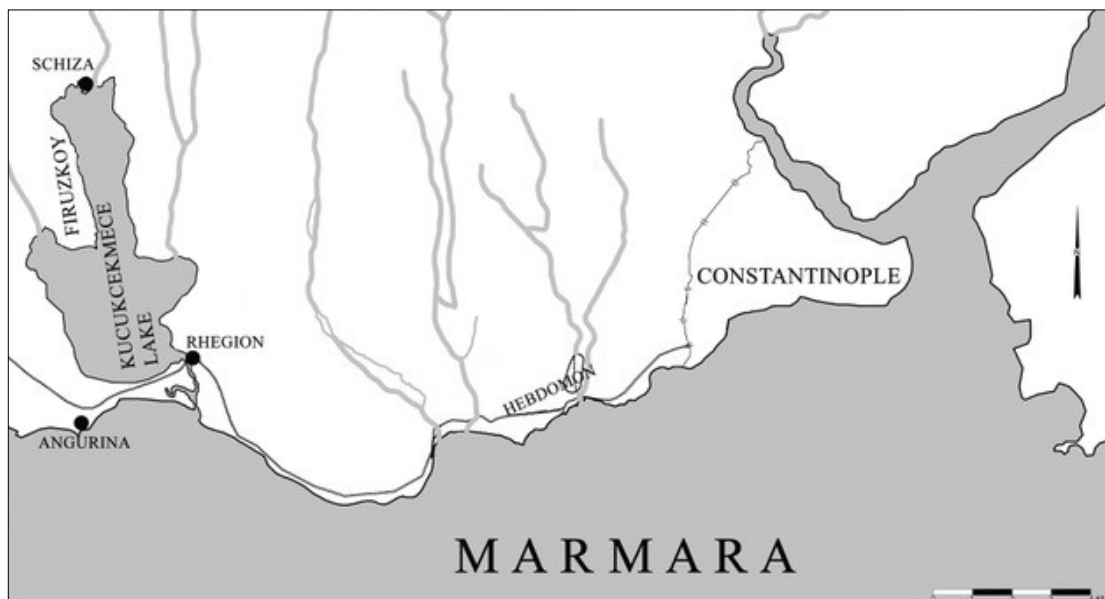


Figure 1. Location of the port complex around Küçükçekmece Lagoon (Angurina, Rregion, Firuzköy Peninsula and Schiza) in the context of the settlement structure of Constantinople.

² Polish scholars are also active participants in this discussion. This is reflected in the chapter by K. Marinow dedicated to ports published in a fundamental work of Polish Byzantinist studies 'Constantinople New Rome. City and People in the Early Byzantine Period' edited by M.J. Leszka, T. Wolińska (2011) and the scientific symposium organised in Szczecin in 2014 and the publication 'City at the Crossroads of Seas and Continents. Early and Middle Byzantine Constantinople as a port city', edited by M.J. Leszka and K. Marinow (2014) with an introduction by M.J. Leszka 'Constantinopolitan ports of the 4th-12th centuries', summarizing the state of research in this area at the time.

The above studies, however, do not exhaust the subject of the ports of Constantinople and leave out the almost unknown port system of Angurina-Rhegion-Firuzköy-Schiza, located in the basin of the Küçükçekmece lagoon. The settlement structure of Angurina-Rhegion-Firuzköy-Schiza is located in the Thracian hinterland of Constantinople in the basin of the Küçükçekmece lagoon, connected to the Sea of Marmara by the Myremex Canal, 18km west of the Bosphorus (Aydingün 2007a; 2007b; 2008; 2010; 2013a; 2013b; 2017a; 2017b; 2017c; Aydingün, Öñiz 2008; 2009; Stanisławski 2017; 2022; Stanisławski, Aydingün 2019; 2021; Stanisławski *et al.* 2016; Stanisławski *et al.* 2021) (Figure 1). The port system consists of structures discovered on the coast of the Sea of Marmara at Beylikduzu, identified as Angurina (Küzler 2008: 251; Öñiz *et al.* 2014; Stanisławski, Aydingün 2021: 313-4), at Rhegion on the south-eastern shore of the lagoon and the Meremex Strait, at Firuzköy Peninsula on the western shore of the lagoon, and at Schiza on the northern shore of the lagoon. The complex of harbours in the basin of the Küçükçekmece lagoon forms the great port of Constantinople (Stanisławski, Aydingün 2021: 39-41, 108-15).

Previously, only small remains of the harbor quays were known to have been unearthed within the city Küçükçekmece, identified with Rhegion/Rhegium, located on the south-eastern shore of the lagoon and excavated in 1938-48 (Ogan 1939; Ogan, Mansel 1942; Stanisławski, Aydingün 2021: 321-43). Most of the harbour foundations and the church complex were discovered in 2007 on the Firuzköy peninsula on the western shore of the lagoon (Aydingün, Öñiz 2008; 2009). Other wharves have been discovered through underwater sonar surveys, aerial surveys, surface surveys and excavations across the lagoon (Öñiz 2017; Stanisławski *et al.* 2016; Stanisławski 2017; Stanisławski, Aydingün 2021; Stanisławski, Szymański 2023). Another element of the port complex described is the harbor marina, the ruins of which are located directly on the shore of the Marmara Sea near the southern end of Küçükçekmece lagoon in the village of Beylikduzu, identified with Angurina (Küzler 2008: 251; Öñiz *et al.* 2014; Stanisławski, Aydingün 2021: 313-4). This port complex of Constantinople was previously completely unknown to the scientific world. On the basis of research into written sources, we have established that this port was referred to as ἐπίγειον...τῆς πόλεως 'port of the City' – a port belonging to/under the jurisdiction of the City i.e. Constantinople, as recorded by Agathias in the 6th century (*Historiae*, vv. 24-25, p. 167).

The aim of the article is to investigate this port complex in accordance with the postulates of the so-called 'seascape archaeology'.³ This project approaches 'seascapes' as the synergy of landscape and maritime archaeology. Landscape, as A. Palladino points out, is a dynamic concept. It refers not only to the environment as it has usually been perceived, but it has a broader meaning – as a way of seeing the landscape, of looking at the transformation of the environment, a place where imaginations, histories, cultural and religious practices, bodies and communities are constantly merging and interacting (Palladino 2022: 25). We use 'seascape' as a holistic term to describe the depth and complexity of human relations with the sea, the ways in which people have used the sea, the importance of the sea in sustaining livelihoods, and the connections between land and sea. Recent archaeology has highlighted

³ The article was written as part of the project *Seascape archaeology of the harbour of Constantinople at Küçükçekmece Lake basin – land and underwater surveys, communication and economical networks, mobility* – OPUS 21 No. HS3/03675 financed by the National Science Centre.

the seascape as a resource locus as well as a formative influence on identity, sense of place and life history. 'Seascape' has also been invoked to reverse traditional land-centered views in archaeological interpretation⁴. In turn, D. Mylona writes: 'The concept of the seascape as a place imbued with meaning by human experience is used here as a framework for the analysis of the archaeological remains of activities that took place along the coastlines [...] The physical remains of fishing, shellfish gathering, fish processing, and modification of seashells serve as proxy indicators of the actions and experiences of the people who made a living from the sea [...] The contextualization of sea-related finds from these sites offers some insights into the shifting experience and meaning of the seascape for different social groups...' (Mylona 2020).

Cultural Landscape

The concept of 'seascape archaeology' has been outlined above. However, the research methodology of this problematic is a separate issue. 'Seascape archaeology' is an area of research that falls within the broader field of cultural landscape studies, with traditional 'landscape archaeology' presenting land-based views, while 'seascape archaeology' presents sea-based views in archaeological interpretation. In each of these approaches, questions of how the landscape was perceived, conceptualised, used and modified by the people who lived in it are fundamental. It is therefore appropriate to apply the research methodology developed in cultural landscape studies. The cultural landscape consists of three spheres: natural, settled and symbolic (Howe 1997; della Dora 2016). In the course of the project, data were collected on all the above-mentioned spheres of the cultural landscape.

The natural sphere of the Küçükçekmece lagoon is extremely complex and unique as it is formed by a variety of elements (Figure 2). Different categories of waters and water bodies meet in the area. Firstly, there are the waters of the Sea of Marmara and the Küçükçekmece Lagoon. These are connected by the *Myremex* Canal. In addition, four rivers/streams (Sazlı Dere, Eşkinoz Dere, Nakkaş Dere - Menekşe Dere, Kapnari Dere) drain into the Küçükçekmece lagoon. Three large bays can be distinguished in the shape of the lagoon: the 'Northern Bay' (conventional term), the 'Western Bay' and the 'Eastern Bay'. The lagoon is fed from the north by four watercourses (three rivers and one stream): the Sazlı Dere, which flows into the 'Northern Bay'; the Eşkinoz Dere, which flows into the 'Western Bay'; the 'Eastern Bay' is the destination of the Nakkaş Dere, which divides into two streams (the Menekşe Dere and the Kapnari Dere) above the mouth. The landscape described above, with the hydrographic structure of the Küçükçekmece lagoon, corresponds to our present situation. However, historically it has been very dynamic and subject to change. This is evidenced by historical cartographic sources as well as archival

⁴ The above demands were formulated by P. McCall Howard and C. Wickham-Jones – the organizers of the session 'Seascape: anthropological and archaeological approaches to the human habitation of the sea', organised by the Association of Social Anthropologists of the UK in 2009 in Bristol.

aerial photographs and new airborne mapping (orthophoto map, thermal imaging, multispectral imagery and LIDAR).

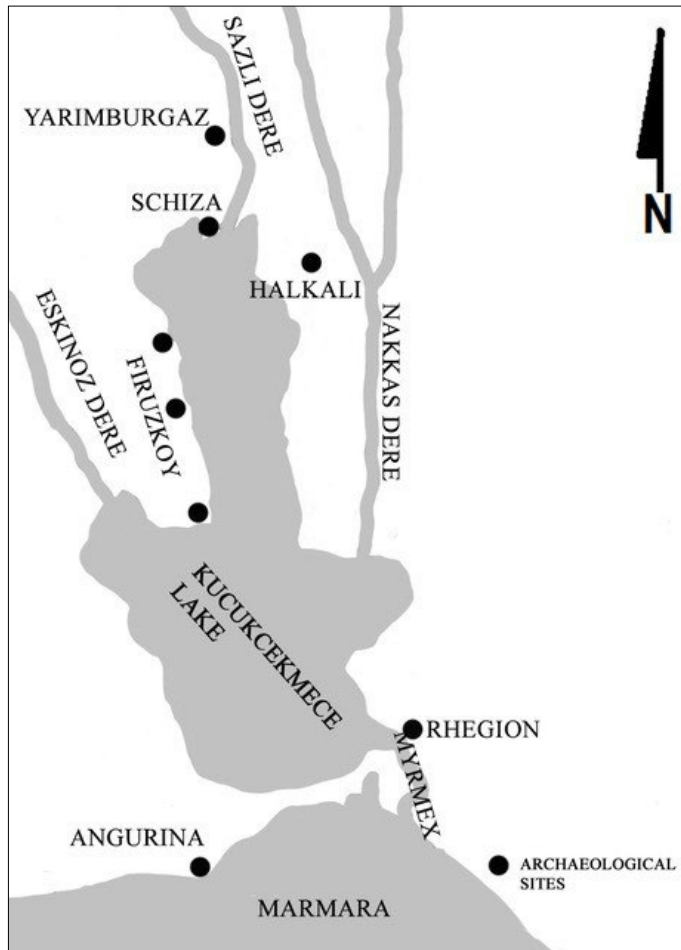


Figure 2. Settlement structure of the port complex around Küçükçekmece Lagoon. This included the ports of Angurina, Rhegion, Firuzköy Peninsula and Schiza.

Unfortunately, the oldest maps by Francesco Berlinghieri from 1482 and the very similar map by Abraham Ortelius from 1584 (Figure 3) do not contribute much to the understanding of the topography of the area under discussion. However, the maps 'İstanbul Haritasi' of 1873 (Figure 4) - and 'Osmanli Arsivi Haritalari' of 1879, which show the shoreline of the lagoon in a different way from today, are worthy of mention (Cebeci 2017: 479, Figs. 6-7). Similarly, the maps 'Marmara Haritasi' from the 19th century (Figure 5) and 'Osmanli Arsivi Haritalari' - the inventory number 007020001. The latter is notable for the shape of the Firuzköy peninsula, which is surrounded by water on three sides (Cebeci 2017: 480-1, Figs. 9-10). There are also maps from the collection of the Ottoman Archives in Istanbul, signed with inventory numbers: 00421 00035, 006 79 00001, 00224 00001, 00143 00001 (Cebeci 2017: 482, 484-5, Figs. 11, 13-15). The eastern half of the lagoon is covered by A. von Milingen's map 'The Essential Istanbul in 17 parts', published in 1911, 1912 and 1914 (Kubilay 2010: 194-195). Also noteworthy is a 1932 map (Cebeci 2017: 486, Fig. 16) which shows the extent of the marshland from the mouth of the Eşkinöz

Dere River to the ‘Western Bay’, which may correspond to the earlier formation of the coastline before the area was silted up by sediments carried by the river.

It can be concluded that the topography of the Firuzköy peninsula and the waters of the lagoon that surround it - the shoreline - have undergone major changes. The peninsula is now surrounded by the waters of the lagoon on the eastern and southern sides. In the past, however, the situation was different. The sources indicate that the Eşkinöz Dere River, which flows into the ‘Western Bay’, was particularly active in this respect. Its mouth used to be much further north (Figure 2). The ‘Western Bay’, on the other hand, was much wider towards the north. This meant that at least a significant part of the western side of the peninsula was inundated by the lagoon’s waters. Over time, however, the sediment carried by the river has silted up much of this basin and it is now marshland. Some similar changes - although on a smaller scale - have probably also taken place in relation to the Sazlı Dere estuary. This has also become silted up with sediment, resulting in a reduction in the size of the lagoon at this location. It is very likely that an important factor in shaping the local relief and the extent of the water bodies has been the numerous and powerful earthquakes that have struck the area in the past and climatic changes (Bariş *et al.* 2021).



Figure 3. The map by Abraham Ortelius from 1584.

On the other hand, based on the results of underwater research and the observations of the arrangements of the relics of the harbour structures (mainly the quays, the lighthouse), we can state that the current water level of the lagoon is higher than it was in Byzantine period. The first indication of this is the large peninsula that used to be at the tip of the Firuzköy peninsula, at the end of which

there was probably a lighthouse (the remains of which have been found during underwater exploration), which is now completely submerged. Similar conclusions can be drawn from observations of the preserved edges of harbour structures, that are now submerged, but whose function would have required them to be well above the water level. The rise in the water level, and consequently the increase in the area of the lagoon, is also indicated by historical cartographic sources, which show that the area of the lagoon was smaller than today. On the other hand, it should be remembered that the area of the lagoon was larger in some places, such as the mouths of the Sazli Dere River into the 'Northern Bay' and the Eşkinöz Dere River into the 'Western Bay', which were silted up and consequently reduced in size.

Another natural feature of the local landscape is the large Yarımburgaz cave (Aydingün 2016; Stanisławski, Aydingün 2021: 315-8) (which in turn contains another water source, this time emerging from the depths of the earth), located near the northern shore of the lagoon, at the foot of which the Sazli Dere river flows. In the past, this place was also associated with the cultural perception of the sea, as evidenced by the rock paintings depicting three boats inside the cave.

It is extremely interesting to analyze the natural landscape of the wider context of the Küçükçekmece lagoon, which includes the area of a section of the eastern edge of Thrace as far north as the Black Sea coast. This area had already been studied from this point of view by H. Aydingün. The Turkish researcher noted that the *Myremex* Canal, the Küçükçekmece lagoon and the Sazli Dere river may have been elements of a larger transportation route in the past. In his opinion, this route may have included, further north, Lake Sazlidere Baraji, Lake Durugöl and the Durugöl Stream. Through these waters and canal system, water communication between the Marmara and the Black Seas was possible. This artery could therefore have been an alternative to shipping through the Bosphorus (Aydingün H. 2022: 55, 62, Fig. 5). One method that allows us to find out which of the above environmental elements of the Küçükçekmece lagoon were conceptualised in a particular way by the community of the time, and what content was attributed to them, is through toponomastic sources. Three such toponyms can be found in the area in question. They are the name of the strait connecting the Marmara Sea and the lagoon - *Myremex*, the former name of the Sazli Dere river - *Bathynias*, and the name associated with the Yarımburgaz Cave *Hagios Georgios* (Bousquet 1900/01). We also know the former name of the Sea of Marmara - *Propontis*. The name of the canal, *Myremex*, appears in the work of Procopius of Caesarea in connection with the repair of a bridge over it, carried out on the initiative of Justinian the Great (Procopius, *Buildings*, 4. 8,10).

We do not know what the name of the lagoon itself was in the past. However, it cannot be ruled out that some hints may be found in historical cartographic sources covering the area in question. We can interpret the information they contain in two ways. Francesco Berlinghieri's map of 1482 does not take into account the presence of a lagoon in this place. However, the river called Dathynio, which flows directly into the lagoon/bay/sea, is clearly marked. On the map of Abraham Ortelius from 1584 the situation is very similar, but in this case the river is called Bathynias. It is therefore possible that the lagoon was perceived by the authors of these maps as a vast estuary of the Dathynio/Bathynias river, and therefore it may have had the same name (?). However, it cannot be ruled out that it was analogous

to the canal that connected it to the sea. This is suggested by A. Ortelius' map *Thraciae Veteris Typus*, first published in 1590 (*Graecia, Sophiani Abrahamo Ortelio descriptore, Antwerp, Christopher Platin 1598*), where the name *Myremex Lacus* is recorded⁵. The same name of the lagoon/lake was also shown on the map 'Thracia Vetus' of 1720.



Figure 4. 'Istanbul Haritasi' from 1873 which shows the shoreline of the lagoon in a different way from today.



Figure 5. The maps 'Marmara Haritasi' from the 19th century.

⁵ There is another toponym, *Ponti Picoli*, associated with the rejoining of the *Myremex Canal* and the *Rhegion* (Turkish *Küçükçekmece*) above it. It cannot be ruled out that the 'Turkes' call it '*Kootchook Chekmeje*', whereas it is called '*Mikro Xorio*' by the 'Greeks' and that *Ponti Piccoli* corresponds with the old *Rhegion* (Ricci 2022: 243).

One of the four rivers flowing into the lagoon, the Sazli Dere, is identified with the Bathynias River (Βαθυνιάς)⁶, whose name is recorded in written sources. It is mentioned by the Greek geographer Strabon at the turn of the 1st century BC (Strabon, *Geographia*, 7, fr. 21 (*olim* 55/56), p. 378, v. 33) and later by Pliny the Elder in the 1st century AD (Pliny the Elder, *Historia Naturalis*, 4. 11. 47, p. 318, v. 7). Bathynias also appears in a text by Claudius Ptolemy in the 2nd century AD⁷. We identify the Yarımburgaz caves with *Hagios Georgios* on the basis of a toponomastic study carried out by R. Bousquet (Bousquet 1900/01). The main elements of the settlement zone around the Küçükçekmece lagoon (Figure 1) are the town of Rhegion, the settlement of Angurina, the settlement on the Firuzköy peninsula, the settlement on the northern shore of the lagoon at the mouth of the Bathynias river identified as Schiza (Külzer 2008: 632-3; Stanisławski, Aydingün 2021: 314-5) (possibly Melatias? (Talbert 2000: 790; Crow 2013: 19; Mango 2000: 175; Węglarz 2017b), the Yarımburgaz cave (due to traces of settlement in and around it), and a number of smaller settlement sites recorded around the shores of the lagoon (Stanisławski, Aydingün 2021: 307-43; Enez 2022).

This structure is part of a wider settlement zone of the eastern edge of Thrace on the European foreland of Constantinople, which has been archaeologically recognised but only to a very limited extent⁸. Archaeological excavations have only been carried out in the Hebdomon area (Demangel 1942; 1945). The exception to this is the area of Küçükçekmece lagoon. Excavations have been carried out first at Rhegion (Ogan 1939; Ogan, Mansel 1942; Stanisławski, Aydingün 2021: 321-43; Ricci 2022), on a large scale on the Firuzköy peninsula, and to a lesser extent at Beylikduzu-Angurina (Külzer 2008: 251; Öviz *et al.* 2014; Stanisławski, Aydingün 2021: 312-4), as well as surface and rescue excavations and surveys of the entire lagoon. The wider settlement context of the neighboring area to the west of the Küçükçekmece lagoon in the Büyükçekmece basin was also recognised, where the settlement structures of the Athyra (Aydingün *Ş. et al.* 2015; Aydingün *et al.* 2017; Aydingün *Ş. et al.* 2020a; 202b; Stanisławski, Aydingün 2021: 371-6) and Episkopia (Külzer 2008: 239-40; Stanisławski, Aydingün 2019: 126-8; 2021: 376-81; Aydingün *Ş. et al.* 2020a; 2020b) centers were identified. Another element of the settlement zone of the region around the Küçükçekmece lagoon is its location between two branches of the *Via Egnatia* road (the older one called *strata vetus* - running north of the lagoon - and the younger *strata nova* - running south of the lagoon), whose roots go back to ancient times⁹. For this reason, the port complex in Küçükçekmece lagoon (Angurina-Rhegion-Firuzköy-Schiza) is part of the spatial and settlement

⁶ Cf. von Hammer 1822: 7; Jireček 1877/2016: 55; Oberhummer 1899; Seure 1912: 558-9; Aydingün 2017a: 75; Węglarz 2017a, *ibid* further literature.

⁷ Claudius Ptolemy, *Geographia*, 3. 11. 6, p. 328. Cf. Appian, *Mithridatica*, p. 418, v. 15, there, this author mentions the river Bithyas (Βιθύας) located beyond Byzantion, generally identified with Bathynias (see, for example, Külzer 2008: 282).

⁸ Cf. Chastelain 1709; Πασπάτης 1879; Jireček 1877/2016; Γεδεών 1935; 1938; Thibaut 1922; Μακρίδης 1938; 1939; Σταμούλη Σαράντη 1943; Janin 1964; Semavi Eyice 1978; Mango 2000; Külzer 2004; 2008; 2010; 2011; Tuna, Şeker 2009; Taddei 2013; Simeonov 2016; Węglarz 2017a; 2017b; Stanisławski, Aydingün 2021: 345-82.

⁹ Cf. Codrington 1903; Hammond 1974; Mango 2000; Külzer 2008: 342-3; 2011: 179-201.

structure centered along the *Via Egnatia* and constitutes important links (Stanisławski, Aydingün 2021: 345-82). It seems that a particular natural element with symbolic significance is the Yarımburgaz cave, which was also seen as part of the seascape. This is suggested by the cave paintings deep inside the cave, which depict images of three ships.

The symbolic sphere, however, consisted mainly of the numerous religious buildings erected around the lagoon, the Christian symbols placed on the architectural details of these buildings, and elements of the natural sphere, such as caves, which were adopted for religious purposes¹⁰. The symbolic sphere of the Küçükçekmece lagoon area (Angurina-Rhegion-Firuzköy-Schiza) is further defined by its wider context and location within the spatial and settlement structure established along the *Via Egnatia*¹¹, whose significance goes far beyond the settlement and communication spheres. In fact, the port complex around the Küçükçekmece lagoon (Angurina-Rhegion-Firuzköy-Schiza) was part of a larger structure located along the final/early section of the route on the foreshore of Constantinople of religious-ideological-social-sedentary significance, the center of which was the capital. In fact, the structure along the *Via Egnatia* also had an important function in terms of serving travellers, of which the *adventus* ceremony¹² was a part. It accompanied the ceremonial entry into the City, the emperor's return to the capital, the arrival of important guests, holy relics and representatives of foreign communities.

As mentioned in the introduction, the cultural landscape was co-created by the settlement, natural and symbolic spheres. However, in the case of some specific areas, such as the Holy Land or the immediate surroundings of the capital of the Eastern Empire (Constantinople was also called the 'New Jerusalem' - the sacralization of which was achieved through the transfer of over 3600 holy relics to it, including the most important objects of Christian worship) (Stanisławski, Aydingün 2021: 383-4), the religious factor also played an important role. For this reason, we can also speak of a sacred landscape that functioned in and with the natural, settlement and symbolic spheres (Howe 1997; della Dora 2016). Both archaeological sources and toponyms provide information on the perception of the sacred sphere. The strong religious character of the study area is indicated by the objects with a religious function found there - man-made architectural objects that are elements of the settlement structure. These are objects with different functions that have been found at sites around the Küçükçekmece lagoon or that have been recorded at these sites by the authors of written sources. Written sources indicate the existence

¹⁰ Caves occupy a special place in the Christian East. According to the Byzantine traditions, caves are the spaces where biblical paradoxical wonders took place, beyond human vision and understanding (della Dora 2011).

¹¹ The settlement structure along the section of the *Via Egnatia* in question further includes: Hebdomon, the settlement of Rhesion - a fortress called Kyklobion or Strongylon was erected there (Janin 1950: 412, 415), the cities of Athyra and Selymbria (Külzer 2008: 637); the centers: Melantias, Episkopia, Daphnusion (Külzer 2008: 323-4) and the fortresses of Apamea (von Hammer 1822: 8) and Ennakosia (von Hammer 1822: 8; Külzer 2008: 186, 252-3), as well as a number of other settlements and villages, hagiassms, cisterns and ports.

¹² Ceremonial *adventus* cf. MacCormack 1972; McCormick 1986; Mango 2000; Tycner-Wolicka 2009: 153-65; Izzi 2010: 132, 135-6, 138-9; Dudek 2013; Stanisławski, Aydingün 2021: 383-93.

of three churches in Rregion (it is not excluded that one of them - dedicated to the cult of Saint Theodore - refers to a site on the Firuzköy peninsula) (Stanisławski, Aydingün 2021: 323-5), one of which was unearthed as a result of archaeological investigations. A marthyrion (Stanisławski, Aydingün 2021: 51-8, 257-69), a basilica (Stanisławski, Aydingün 2021: 32-8, 247-57; Stanisławski *et al.* 2021) and a noskomeion - with a sacred medical function (Stanisławski, Aydingün 2021: 64-103, 269-80) - have been discovered on the Firuzköy peninsula. On the southern shore of the 'Western Bay', another temple-basilica was recorded from archival aerial photographs (Stanisławski, Aydingün 2021: 309-11; Stanisławski *et al.* 2021: 232-4, 256-7, Figs. 18-21). Another church was located at Halkali on the eastern shore of the lagoon (Enez 2022: 26, 38, Fig. 8). The above religious buildings can mark the boundaries, create a kind of mental map in which the community functioned.

The numerous artefacts found in the harbor and the architectural structures mentioned above are also of religious significance. Due to the extent of the research, most of them have been recorded on the Firuzköy peninsula. They include: bronze cross-shaped pendants (a cross of the so-called 'Holy Land' type decorated with an image of an orantine woman and four medallions with images of the Evangelists; a cross decorated with a 'bird's eye' motif), stone raw materials and amber; two processional crosses, an iron votive cross, a belt buckle decorated with a plastic cross motif (so-called 'cross-shaped' type), lamps, a cross-shaped lamp-shade, a lamp-post. Two processional crosses, an iron votive cross, a belt buckle decorated with a plastic cross motif (the so-called 'cross-shaped' type), olive oil lamps decorated with plastic cross motifs, pitos decorated with motifs of the cross and angels, vessels with the symbol of the 'Knot of Solomon' symbol on the bottom, vessels with the image of a winged lion on the bottom - the symbol of Mark the Evangelist, a bull with the image of the bust of the Virgin Mary with the medallion of Christ and two crosses on the sides were also included to this category.

The interpenetration of the natural and sacred spheres can be seen in relation to the Yarımburgaz cave, with which the toponym Hagios Georgios is identified (Bousquet 1900/01). The function of the cave in the religious sphere is further indicated by the relics of the rock monastery carved into its interior, especially the apses, which reflect the shape of the basilica from the inside.

Seascape Thinking

In the interpretation phase, we tried to clarify the meaning of the recorded spring structures (within the settlement, natural and symbolic spheres) that function in and with the religious sphere. They represent a manifestation of the interaction between imagination, cultural and religious practices, contents present in this space, reflecting the way the landscape and especially water bodies are perceived and conceptualised. We base our interpretation on assumptions developed in cognitive anthropology and archaeology. According to the cognitive sciences, culture is a symbolic system with close parallels to the language system. It is a set of models for perceiving, associating and interpreting the world. These models are available to our cognition by determining the answers to the questions:

what kind of elements the components of the above models are and how they are organised (Buchowski and Burszta 1993: 13; Tyler 1993: 27; Renfrew and Zubrow: 1994).

The analysis of the source data was carried out with the aim to answering the questions: what kind of elements form the structures of the natural, settlement, symbolic and sacred spheres of the area of the Küçükçekmece lagoon area and what are the relations between them? These relations form the basis for defining the cultural landscape model of the community under study. At the stage of analyzing the natural sources, we distinguished the structure available to our cognition based on toponomastic data. Man gave names to the Sea of Marmara (*Propontis*) + the chanel connecting it to the lagoon (*Myremex*) + the lagoon/lake (*Myremex Lacus*) + the river flowing into the lagoon from the north (*Bathynias*) + the cave (*Hagios Georgios*).

Embedded in the above natural structure is the settlement zone with its elements that reflect the way the local community interacts with the marine and water environment: Angurina + Rhegion + settlement on Firuzköy + Shiza; together with the elements of the port infrastructure: grain port on the seashore at Angurina + port at Rhegion + port and lighthouse and administrative and commercial center on the Firuzköy peninsula + quays at several points on the lagoon shore + port (?) at the mouth of the Bathynias River. The above structure is complemented by the *Hagios Georgios* cave, which contains cave paintings depicting images of ships. The community that created and managed the above settlement and port structure maintained communication and exchanged goods, people and ideas with other communities in the Mediterranean and Black Sea areas (this is evidenced by finds: anchors, amphorae carried on ships, antiquities of foreign origin).

The whole area was surrounded by a number of temples: two or three were built in Rhegion (Saint Stratonicus, Saint Callinicus and Saint Theodore?), others on the eastern shore of the lagoon at Halkali, the next one on the western shore of the lagoon, and monasteries were built on the Firuzköy peninsula (Saint Theodore?) (Stanisławski and Aydingün 2021: 286-95) and in the Yarimburgaz cave (*Hagios Georgios*). An important part of the monastic activity on the Firuzköy peninsula was pharmacy and medicine (Aydingün *et al.* 2024), the center of which was the nosokomeion building, the largest architectural structure known in the area. This was a particularly important factor in the 'life of the port' in the 6th and 7th centuries AD, given the deadly threats that came 'from the sea', in the form of the plague, smallpox, malaria and leprosy epidemics that raged at the time and were spread by ship crews¹³.

¹³ The end of antiquity, especially the 6th and 7th centuries AD, when the *noskomeion* on Firuzköy was created and operated, posed a particular challenge to medicine. Smallpox and malaria were spreading at that time (Grmek 1989: 275-83; Gowland and Western 2012). Leprosy, which previously occurred sporadically, became endemic (Grmek 1989: 168-76; Sallares 1991: 239-41). Bubonic plague, so-called Justinianic plague – the most dangerous disease of that time, was a new phenomenon (Biraben and Le Goff 1975; Wójcik 2011; Tsiamis 2019; 2023; Milewski 2021). The epidemic broke out in 542 in Egypt and spread across the Mediterranean in the following years. In Constantinople, it led to a decline in the population. The epidemic returned in AD 558. The era of the reign of

The unifying factor of the above structure and its individual links was water: elements of the settlement structure were built over water (sea, strait, lagoon/lake, river, spring in a cave). In addition, water was distributed through an elaborate system of canals, aqueducts and water pipes made of ceramic pipes around the Firuzköy peninsula and inside the nosokomeion building; as well as stored in cisterns. Sacred buildings dedicated to Saints Theodore, George, Stratonikus, Callinicus were constructed within the above natural-settlement structure. The names of the saints were imprinted on the bricks used for the construction of buildings with different functions (Saints Kyriakos, Trophimos, Abericus, Gelasios, Mamas, Marcos) (Stanisławski and Aydingün 2021: 200). There were monuments characterised by Christian religious symbolism. In the 12th-13th centuries AD, St Mark was also worshipped in the area, as evidenced by several ceramic artefacts decorated with the symbol of the Evangelist. Deep inside the Yarimbürgaz cave, however, three images of ships were painted on the wall.

The cognitive analysis of the source data allowed us to distinguish the following structures operating within the different spheres of the cultural landscape:

Natural sphere: SEA + CANAL + LAGOON + RIVERS + CAVE

Macro-scale settlement sphere: ANGURINA (harbor settlement) + RHEGION (town, harbor, administration and religious centre) + FIRUZKÖY (settlement, harbor, monastery, medical center) + HALKALI (settlement, place of worship) + SCHIZA (settlement, harbor?) + HAGIOS GEORGIOS (monastery)

The micro-scale settlement sphere, exemplified by the best-studied settlement located on the Firuzköy peninsula, consisted of elements such as: HARBOUR (QUAYS + LIGHTHOUSE) + MONASTERY (MARTYRION + CHURCH + NOSOKOMEION) + ADMINISTRATIVE AND COMMERCIAL CENTRE + CISTERN

Symbolic sphere: CHRISTIAN SIGNS AND SYMBOLS + BOATS

We assume that the above structures are a reflection, on a material level, of the way the community of the time perceived, associated and conceptualised the world - a model of their culture. Summarizing the nature of the above relationships, in the cultural model of the community living on the shores of the Sea of Marmara around the Küçükçekmece lagoon, we can distinguish a structure that consists of four essential elements-contents: **WATER + SHIPPING + RELIGION + MEDICINE**

In order to arrive at the meanings reflected in the above account, it has been examined in the wider cultural context of Byzantine society living in Constantinople, its environs and the eastern Mediterranean world in the 6th century AD. Here we are guided by the assumptions developed in contextual archaeology, according to which an archaeological source is a meaningful structure and the

Justinian the Great (527-565) and his successors in the 6th and 7th centuries AD, during which these diseases expanded, marks a turning point in the health of society and the development of medicine of that time (Little 2006; McCormick 2009: 47-50).

meaning of material culture products is determined by the cultural context in which they originated and functioned (Hodder 1995: 150-88). The broader cultural context of the investigated harbour structure is determined by the cultural centres with which the community living in the Küçükçekmece lagoon basin maintained contacts. The network of these connections can be reconstructed on the basis of imported artefacts found at Angurina, Rhegion, Firuzköy and Schiza.

The typological analysis of the amphorae showed the presence of products imported from Palestine, Cilicia and Cyprus, the Aegean region, North Africa - from the areas of Tunis and Egypt, and the areas of Colchis in the 6th and 7th centuries (Kara 2017). They were mainly used to transport wine and olive oil, but also other goods such as garum, honey or lentils. From what we know about the use of different types of amphorae as containers, we can conclude that amphorae of type LR2B, LR2C and Ephesus 56 were used to transport olive oil from the Aegean region. On the other hand, amphorae of type LRA3 were used as containers for the transport of wine, also from the Aegean region. Wine was also imported from the region of Cilicia, possibly from Cyprus or the Aegean coast of Anatolia, and possibly from Crete in LR1 and LRA1B amphorae, and from Egypt in LR7 amphorae (Kara 2022: 110-2).

We can further specify the above network of shipping connections and contacts by taking into account other categories of goods of foreign origin discovered in the area of interest to us. These are African Red Slip pottery from the area of present-day Tunisia (McCormick 2009: 63-72; Hayes 1972; 1980; 1997; Tortorella 1986; 1995; Reynolds 1995), and stone raw materials (Proconnesian marble, *verde antico*, *giallo antico*, Docimean marble, Carium marble, *rosso antico* marble, Naxos marble, Spartan porphyry - *lapis Lacedaemonius*, alabaster, three types of Egyptian porphyry - *porfido rosso*, *porfido verde* and *porfido nero*) imported from various areas of the Aegean basin, Anatolia and Egypt (Stanisławski and Aydingun 2021: 201-11; Sazak *et al.* 2023). Cereals probably also came from Egypt and were collected at the port of Angurina. The plants most likely to have been used for medical purposes, whose presence was noted at Firuzköy, were also imported (myrrh and frankincense - specific to the southern region of the Mediterranean and the Red Sea, silphium - a plant found on the southern coast of the Mediterranean, especially in the areas of Libya) (Özcan 2017; 2018). On the basis of all the above categories of finds, we can reconstruct the network of maritime connections of the port complex under discussion, which is illustrated in the plan below (Figure 6).

The above-mentioned regions, with which contacts were maintained, were also important intellectual centers of Christianity at that time, the activity of the Church Fathers, theologians and thinkers. We will attempt to interpret the above cultural model by placing it in the context of the religious perceptions and superstitions of Late Antiquity. In this regard, we will pay special attention to the way Christians of that time perceived and interpreted the world, which is formed by an analogous conceptual structure (WATER + SAILING + RELIGION + MEDICINE) as the one we have distinguished on the basis of material and toponomastic sources registered around the Küçükçekmece lagoon. Numerous texts of the Church Fathers are a source of knowledge on this subject.



Figure 6. The reconstruction of the network of maritime connections of the port complex around Küçükçekmece Lagoon in the 6th-7th centuries.

The sea and the boat are allegories that they often used to illustrate the theological thought of early Christianity. We can assume that the contents and ideas propagated in these texts were well known to the community living in the area of the Küçükçekmece lagoon, both because of its location close to Constantinople (which was a political, cultural, religious center) and because of the communication and sailing links (through which people, ideas and goods were exchanged) that they maintained, especially in the 6th century, covering all areas of activity of the Christian thinkers and Church Fathers of the time. These texts show that ancient maritime symbolism was firmly embedded in the context of patristic exegesis and was an integral part of the theology of the early Church (Wróbel 2008: 1245). They used allegories of the sea, navigation, the port, the ship and its elements (rudder, mast, anchor, wood - of which the ship is made). Another allegory is that of the lighthouse.

According to the religious beliefs and superstitions of the time, the sea was the home of demons and bizarre sea creatures. Any sea voyage was a risky undertaking. These ideas also permeated the consciousness of Christians in the first centuries of Christianity. As a result, the sea was associated with the devil and his minions, inspiring fear and posing a threat to the Church. Echoes of this symbolism can already be found in the theology of St Paul when he presents the opposition between the kingdom of Christ and the world of the devil. The inspired writers used ancient mythological images, but from different doctrinal perspectives. For them, the abysmal sea was an image of mortal doom (Ps 69:3), because they were convinced that the bottom of the sea - according to the knowledge of the world at that time - was adjacent to the *Sheol* (Jn 2:6n). The images of the sea were accompanied by visions of evil powers roaming the sea in the form of mythological beasts. The sea thus became an image of power turned against God. The biblical perception of the sea includes the term *abyssus*¹⁴, used to describe the

¹⁴ Cf. Ps 45:3; Hi 28:14; 38:16; Ps 41:8; 77:15; 103:6; 105:9; Jn 2:6; Koh 24:8; Is 51:10; Gen 1:2; Lk 8:31; Rev 9:7-8.11.

mysterious depths - 'the heart of the sea' (Ps 45:3), the place to which demons were sent (Wróbel 2008: 1245-50).

The allegory of sailing, on the other hand, depicts human life as sailing towards a safe harbor - paradise and eternity (Christ instructed both his disciples and human beings to cross to the other shore). The ship is another of the most frequently used allegories, drawing on the tradition of ancient thought as well as the biblical accounts of Noah's Ark, Christ calling Peter and Andrew to be his disciples - 'Follow me and I will make you fishers of men' (Mt 4:19), Christ calming the Sea of Galilee, or the writings of St Paul (1 Tim 1:19). Early Christian theology compared the Church to a ship sailing through a dangerous sea to a safe harbor. We find the above allegories in the works of many Christian authors of the time.

Several Christian writers have also used allegories to refer to the structural elements of a ship, a practice initiated by St Paul when he wrote of the strong anchor of the soul (Heb 6:19). Hippolytus (d. AD 235) was the first to analyze the elements of a ship and give them an allegorical meaning. He writes that the sea is the world in which the Church, like a ship at sea, is tossed about but does not break up because the experienced helmsman, Christ, is on board. At the center of the ship is the sign of victory over death, the cross of Christ. The handle of the rudder is the two Testaments, and the ropes that encircle the ship are Christ's love, tightly embracing the Church. It also has iron anchors: these are Christ's holy commandments, strong as iron. The sails, raised high on the masts, are the followers of the prophets, martyrs and apostles (Hippolyt, *O Antychryście* 59).

Christ sits at the helm in the work of Macarius the Egyptian (d. AD 390). He writes that a boat, in order to sail happily, needs a helmsman and a favorable wind; well, the Lord, when He dwells in the faithful soul, fulfils all these requirements, as He helps the boat to overcome dangerous storms. St Ambrose (d. AD 397), on the other hand, wrote that we should consider the ship as a symbol of the Church, floating on the open sea. It is a ship that, though often shaken by waves and storms, is never wrecked, because Christ hangs on mast, on the cross, the Father sits at the stern, and the Holy Spirit, the Comforter, steers the ship. Twelve oarsmen, the Twelve Apostles and an equal of number of prophets straits of the temporal world. Allegories relating to sailing and the ship were also used by John Chrysostom (d. AD 407), for whom the boat is the faith of the two Testaments, the helmsman at the bow is God the Father, the helmsman at the stern is Christ, the rudder is the Holy Cross, the sail is Divine Grace, the good wind is the Holy Spirit, the oarsmen are the Apostles and disciples of Christ, and the passengers are the prophets (John Chrysostom, *Homilia o zbawczym Krzyżu*).

Maximus of Turin (d. AD 423) wrote that the boat is the Church, which sails the sea in such a way that, while the world perishes, she saves those on board. The Church is reminiscent of Noah's Ark, which, when the world was swallowed up by the flood, saved all who were on board (Maximus of Turin, *Kazanie* 49,4). St Augustine (d. AD 430) also used the allegory of the boat - the Church - in a very similar sense (Augustine, *Objaśnienia Ps* 93,25). St Peter Chrysologus (d. AD 450), in turn, wrote that a boat needs Christ to cross the sea to the port of heaven (Peter Chrysologus, *Kazanie* 32.5, 37.2, 50.2). Maximus of Turin, in the 5th century AD, compared the mast of a ship to the cross in the Church. St Boniface (d. AD 754) compared the Church to a great ship that needs men to steer it on its journey. These were the first popes

Clement, Cornelius and the bishops who steered the ship of Christ during the reign of the pagan emperors (Boniface, *The Letter* 78).

Another allegory of Christianity at the time was the lantern, the concept is which is part of the spiritual context of Byzantine monasticism. It is reflected in the words of Theodore Studite (d. AD 826), who addressed the monks to the light, alluding to the idea of Christ as light, and indicating that monks should shine like stars. The above statement also defines the task of the monks to lead orthodoxy safely in the face of the storm of iconoclasm (Theodore Studites, *Epistle* 201, 10-13, p. 324). The same theme was used by Eustathius of Thessalonica, who compared monks to lighthouses (Eustathios of Thessalonike, *Episkepisis* 198-9, 230). Similarly, John - the abbot of the monastery of Chalke, associated with the monastery of Studion - used the same metaphor in reference to a monastery on the island of Chalke, one of the Princes' Islands in the Sea of Marmara - a monastery that shines brightly to indicate its location.

The above metaphors are related to the functions of the monastery and its location on the ground – the topography. In fact, monasteries had not only a religious function, with the task of spiritual enlightenment, but also a practical purpose. Indeed, the sites where monasteries were built were not only intended to provide the peace and solitude associated with the spiritual-religious sphere of the monks' lives; but also, to influence the surrounding space. The location of monasteries on the coast, near ports, determined their interaction with the marine environment. The monasteries were heavily lit, so the 'shining' of the monasteries had not only symbolic-spiritual but also practical overtones. They were also used to help sailors and to control maritime communication (Kountoura Galaki 2022).

Monasteries were also important centers for the practice of medicine and places associated with pilgrimages for health (McCormick 2009: 47-50, 675-81). This is also related to the location of monasteries near ports. Contemporaries were well aware that the *foci* of the epidemic were port centres, that the disease spread by sea, that the plague was spread by ships sailing on the sea, and that the first victims of the epidemic were the sailors on those ships (McCormick 2009: 116-7). The disease could therefore be seen as one of the pejorative influences coming from the sea. This factor played a particularly important role in the 6th and 7th centuries AD, the period of the spread of the great pandemics of the time, plague, smallpox, malaria and leprosy, which decimated the population of the world at that time, probably leading to its collapse and crisis, which lasted until the 7th, 8th and until the end of the 9th centuries AD.

The structure created by all the above elements/contents WATER + PORT + MONASTERY + MEDICINE reflects a certain concept – 'seascape thinking', which illustrates the way people of that time perceived the natural environment, especially water and the sea, the contents attributed to it, the threats associated with it, the activities of people on it and their relationship with the Creator. It was the basis for actions aimed at imposing a certain order on nature, transforming nature, shaping and transforming the real landscape into a symbolic landscape.

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Puteoli and the Ripa Puteolana. New Underwater Research in the Portus Annonarius

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Abstract

In the coastline between the harbor of Pozzuoli and Lake Lucrino, in the western part of the Gulf of Naples, various archaeological evidence has emerged over time that can be traced back to the ancient Phlegraean city of *Puteoli*. Particularly, in the stretch between the modern harbour and the ancient *Portus Julius*, two important peripheral quarters of the city have been identified in recent decades: *vicus Lartidianus* (seat of the merchants and pilgrims from various places in the Mediterranean basin) and *vicus Annianus* (seat of the warehouses and *horrea* serving the fleet of *Misenum*). During several decades this territorial context was scarcely explored, also due to the massive industrialization of the area.

With this in mind, the project ‘*Tra terra e mare. Studies and research in the coastal areas of the Phlegraean Fields*’, promoted by the SABAP for the metropolitan area of Naples and the University of Campania ‘Luigi Vanvitelli’, with the collaboration, for the submerged areas, of the *Scuola Superiore Meridionale*, aimed at the systematic documentation of the *ripa*. In 2022, the project began with the execution of aerial and underwater surveys over an area of 11 hectares, which made it possible to recognise several complex harbour structures and architectural remains, as well as marbles, columns, pottery and metals.

Historical Introduction

Since antiquity, the coastal strip located in the western portion of the Gulf of Naples has been the subject of important settlement dynamics, first Greek and then Roman. Today’s Pozzuoli, in fact, is in the volcanic region of the Phlegraean Fields, in the centre of a gulf (named *sinus puteolanus* since antiquity and today called the Gulf of Pozzuoli). It was here, around 530 BC, that the city of Dicaearchia was founded by exiles fleeing from Samos because of the tyranny established by Polycrates. In this same place, the Romans founded *Puteoli* in 194 BC, considering the extraordinary potential of its location and of its natural bay, perfectly adaptable to port structures, and decided to exploit it to the full, thus creating the great commercial and trading harbour. This port became very important and developed in a few decades, growing from its primordial nucleus at the base of the acropolis of Rione Terra throughout the late Republican age (Camodeca 1994). At the beginning of the Augustan period, the harbour already

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occupied a very important portion of the coastline of the Gulf of Pozzuoli: in fact, it extended from the current area of the modern commercial harbour to the Lucrino and Averno lakes. To this period, moreover, we owe the construction of the *Portus Julius* by Agrippa, who built it very quickly in 37 BC to respond to the growing threat posed by the piratical activity of Sextus Pompeius (Gianfrotta 2012).

This coastal strip, which we call *ripa Puteolana*, about 2km long on the sea front, thus joined the former late-Republican harbour with the new *Portus Julius*. The space was then occupied by commercial, residential and religious structures, with the creation of two suburban quarters, *vicus Lartidianus* and *vicus Annianus*, in which communities of *peregrini* and *mercatores* from all over the Mediterranean basin, settled.⁴ The harbour, with gigantic and highly articulated structures, even described as Roman-sized (Camodeca 2014; 2018), was not greatly affected by the inauguration of the new Roman harbours of Ostia-Portus, built first by Claudius and then by Trajan, and certainly remained in use at least until the Theodosian age, as epigraphic and now archaeological data can show.

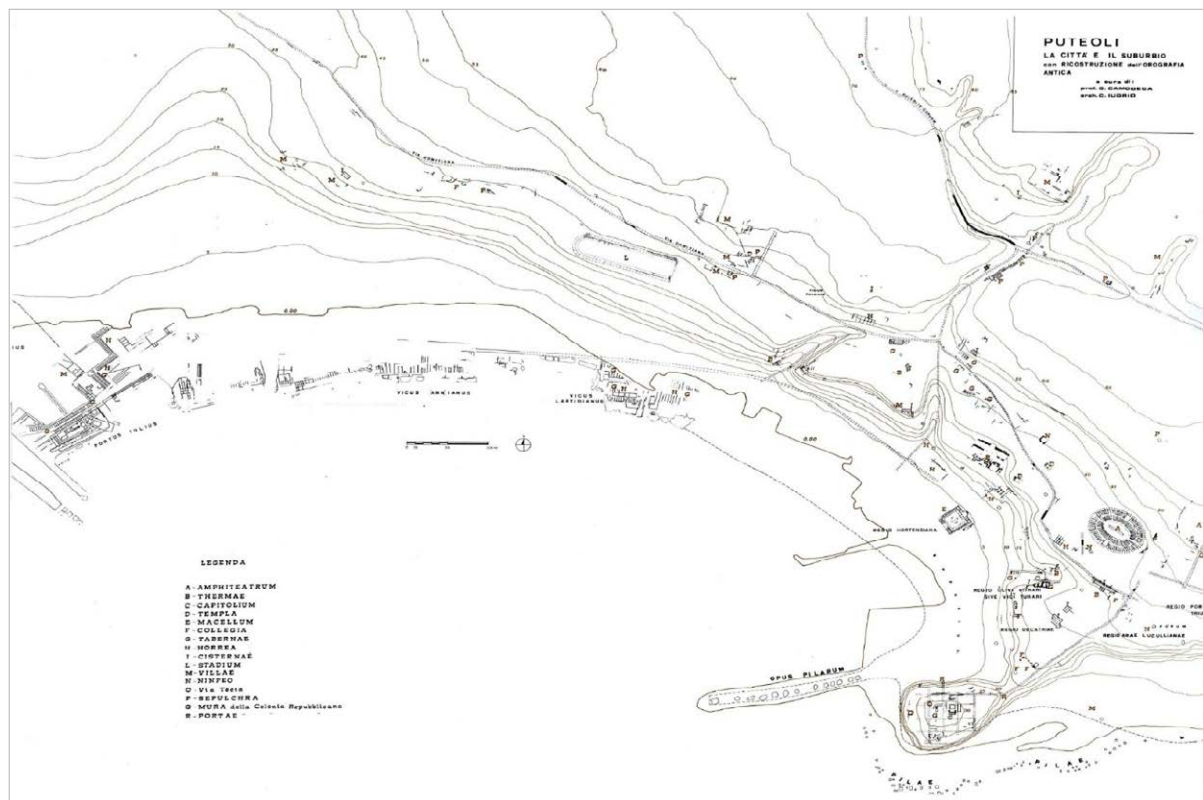


Figure 1. The original map of the submerged harbour of *Puteoli* (After Camodeca 1994).

⁴ The existence of these two *vici*, in addition to the archaeological evidence discussed in this text, is testified by epigraphic sources; in particular, mention should be made of AE 1977, 200 = EDR076736 (which reports a dedication donated by the *inquilini vici Lartidiani* to the emperor Hadrian in 121 AD) and AE 1977, 201 = EDR076737 (a dedication by the *inquilini* of the *vicus* [---]ianus. The gap in the name of the *vicus* was reconstructed and interpreted by Camodeca as *Annianus*. On the subject: Camodeca 1977: 77 and figures; 2018: 62-5.

State of the Art

The literary, epigraphic and historical sources are very well researched and perfectly describe the life and activities in the harbour of *Puteoli*. The submerged structures, however, have only been partially studied due to the difficulties of mapping a very large, submerged area. One of the main reasons for this state of affairs in the study of the *ripa Puteolana* is due to the intense industrial activity, witnessed by the cumbersome presence of the industrial district that arose in the suburbs of modern Pozzuoli from the end of the 19th century, characterised by the presence of shipyards, metallurgical industries, until the more recent industry (Prysmian) dedicated to the production of hanks of cables for transoceanic communications and telecommunications. Heavy water pollution, poor visibility and various risks and dangers for divers effectively made the access to the coastline of the ancient *ripa* almost impracticable until the 1980s.

It was only during this period that a team from the University of Naples, coordinated by Prof Giuseppe Camodeca, began a series of research studies on this area, based on the interpretation of the aerial photographs available at the time and a campaign of well-calibrated underwater investigations. The result of this precise study was the production of an archaeological map of the underwater structures (Figure 1). This study allowed the identification of the Nabatean sanctuary in the centre of *vicus Lartidianus* and dedicated to the god Dusares, from which some inscriptions in the collections of the National Archaeological Museum of Naples and the National Archaeological Museum of the Phlegraean Fields (Lacerenza 1991) came. The research carried out by the Camodeca team thus made it possible to outline the potential that the area of the ancient *ripa Puteolana* offered, as it clearly rendered the image of a densely built-up archaeological landscape, with a long series of elongated and rectangular structures, in most cases arranged along communication axes, almost certainly to be read as *horrea*, together with a long sequence of concrete quays (Stefanile 2021). After this research, an underwater study was carried out in 1991 by the Superintendency of Naples at the shoreline on which the Maglietta boat jetty would later be built. The study identified masonry structures in *opus reticulatum* connected to a portico with columns datable to the Augustan period (Lombardo 2021: 70-2). More recently, magnetometric prospections have been carried out around the *vicus Lartidianus* (Giordano and Maniscalco 2002).

Despite the efforts pursued by this team, interest in the site waned very quickly and for long time no further research was conducted there.

Mapping the *Ripa Puteolana* and the GIS Platform

A first step in this study was to systematically update the previous cartography of the *ripa Puteolana*. Thus, a new cartographic description of all the submerged and semi-submerged evidence, only partially visible in the satellite coverage available today, was carried out.

As pointed out in the previous paragraph, the knowledge of the areas located between *Puteoli* and the Lucrino, namely the *vici Lartidianus* and *Annianus*, is known mainly thanks to the studies of Giuseppe Camodeca, the results of which are summarised in the planimetry first published in 1987, then updated in 1994 and in 1999 (Camodeca *et al.* 2001).

The need to redefine and implement the previous cartography immediately directed the project towards the construction of a GIS-based information storage system. These systems, which have been indispensable in archaeological practice for a few decades (Bogdani and De Mitri 2017), make it possible to manage, from a technical point of view, multiple aspects that are functional to the purpose of the research: the possibility of storing previous cartographic documentation and implementing and systematising new acquisitions; sharing the database with several users belonging to different institutions; easy consultation by non-expert users. Based on these assumptions, it was decided to use the software included in the ESRI package, a leading company in the development of GIS software worldwide and now used as a commercial standard: for the creation and management of desktop content, the ArcGIS Pro software was used, for the creation and management of web content the related ArcGIS Online package.⁵

With the gradual decommissioning of industrial activities and their factories, and the current phase of ascending bradyseism, new environmental conditions have been created that make it possible to carry out new underwater reconnaissance and thus document the archaeological structures still present. Given these new conditions, it was decided to use SAPR and UAV aerial survey systems. SAPR (Remotely Piloted Aircraft Systems) and UAV (*Unmanned Aerial Vehicle*) systems, more commonly known as drones, allow sites of interest to be periodically monitored and documented (Minucci 2018: 91-114). In the case of the *ripa Puteolana*, three different drones were used for the acquisition of high-resolution images, useful for the creation of photographic and photogrammetric documentation of the area. The models adopted are all from the DJI manufacturer (Phantom 4, Mavic Air 2 and Spark).⁶

The methods of image acquisition were twofold: free flight for the documentation of the submerged archaeological evidence, and planned flights to cover the entire area for photogrammetric purposes. The flights were carried out between December 2021 and February 2022 and were repeated periodically, taking into consideration certain climatic and meteorological aspects, such as different light, wind and wave conditions. These climatic and meteorological aspects, in fact, strongly condition the visibility of the submerged structures (it is sufficient to consider that wave motions produce an uplifting of the sands that modifies the seabed during the filming) and can create light distortion and reflection phenomena on the water surface. Therefore, the weather conditions were verified with dedicated applications.⁷

⁵ <<https://www.arcgis.com/>>.

⁶ Now the fleet has been enlarged with acquisition of a DJI Mini Pro 3 and a DJI Mini Pro 5.

⁷ The Windy and UAV Forecast applications were used.

The images were subsequently processed using the Agisoft Metashape Pro *image-based* photogrammetry software. The models thus created were georeferenced using eight targets placed along the cliffs of the *ripa* and surveyed with differential GPS (Leica GS18), and the RDN2008/UTM zone 33N reference system (EPSG: 6708) was used for the cartographic restitution of the extracted orthophotos. From the three-dimensional models processed with these parameters in Agisoft Metashape, two orthophotos of the *vici Annianus* and *Lartidianus* were extracted (Figure 2). The extraction parameters of the orthophotos are respectively 1.99 and 2.88 cm/pix with an accuracy of less than 3cm for the reference checkpoints. The orthophotos produced in this first phase of data acquisition were useful as support for detailed underwater reconnaissance.

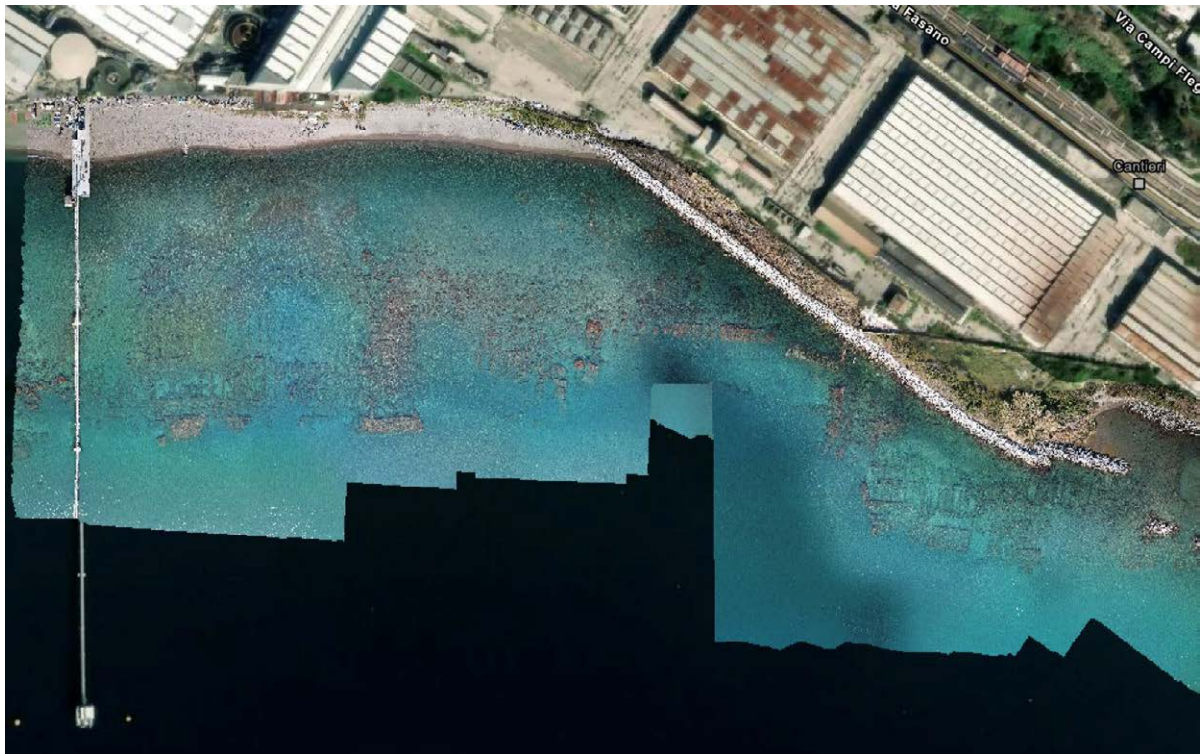


Figure 2. Orthophoto of the area.

Underwater Activities

As of February 2022, the first in-water exploration activities began. The inspections were carried out both with direct inspection by diving and with the use of an ultra-high-definition wire-guided robot.⁸ Thus, the entire area of the *vicus Lartidianus* was documented and a preliminary exploration of the eastern area of the *vicus Annianus* was carried out. Activities resumed in May and June 2022 with a diving

⁸ The tool was made available by Chasing Industries inc. as part of a cooperation agreement with the Scuola Superiore Meridionale.

campaign involving students from the Underwater Archaeology program of the University of Cadiz.⁹ This first campaign also investigated the submerged areas of the *Vicus Annianus* up to the modern limit formed by the Prysmian wharf (former Pirelli wharf), near the boundary between the areas under the jurisdiction of the Soprintendenza Archeologia Belle Arti e Paesaggio for the Naples Metropolitan Area and the Campi Flegrei Archaeological Park.¹⁰

First Research Results

The first underwater reconnaissance campaigns, carried out in February and in May and June 2022, yielded some interesting initial data. Firstly, it was possible to verify the compatibility of the photogrammetric survey, with restitution at a scale of 1:100, with the degree of accuracy of the orthophotos of the submerged archaeological structures, confirming the validity of the survey. With the first explorations of the *vicus Lartidianus* (Figure 3), the so-called portico of the Nymphs could be relocated. In an excellent state of preservation, it consists of 14 columns, 70cm in diameter, made of piperno stone, aligned in a porticoed row of 65m, interrupted only by the artificial cliff to the east. Moreover, for a small portion of its length, approximately 21m, the alignment of the columns appears parallel to a very massive *opus caementicium* structure with some elevations and a marble entrance sill. Likely, this is a structure already excavated in 1972, and which was interpreted, at least for a phase, as a sculptor's workshop (see Giordano and Maniscalco 2002).

A short distance from the eastern limit of the portico, about 10m and close to the modern artificial breakwater, a room with two *dolia* buried to the rim, was documented. A more extensive exploration of the *vicus Lartidianus* allowed to recognize the entire articulation of the area, characterised by a vast series of *horrea*, arranged in two rows, harbour docks and warehouses. The *horrea* appear very articulated: spaced by a series of small service roads and small quadrangular rooms, possibly courtyards for the storage of goods, they had a standard module of 12x14m and encircled a storage area of about 50sqm but adapted to the space they occupied (in many cases the shape assumed is rectangular, in others trapezoidal).

⁹ For these activities, a collaboration agreement was signed with the University of Cadiz for extra-curricular practical activities.

¹⁰ After the presentation of this text at the SOMA congress, and during the publication process, the activities continued with the precious financial support of the Univeristy of Campania and now of the American Institute for Roman Culture. New data, both from the *vicus Lartidianus* and the *vicus Annianus* are in course of study and publication. See now: Stefanile *et al.* 2023; Stefanile *et al.* 2024a; Stefanile *et al.* 2024b; Stefanile *et al.* 2024c; Tardugno *et al.* 2025; Stefanile 2025.

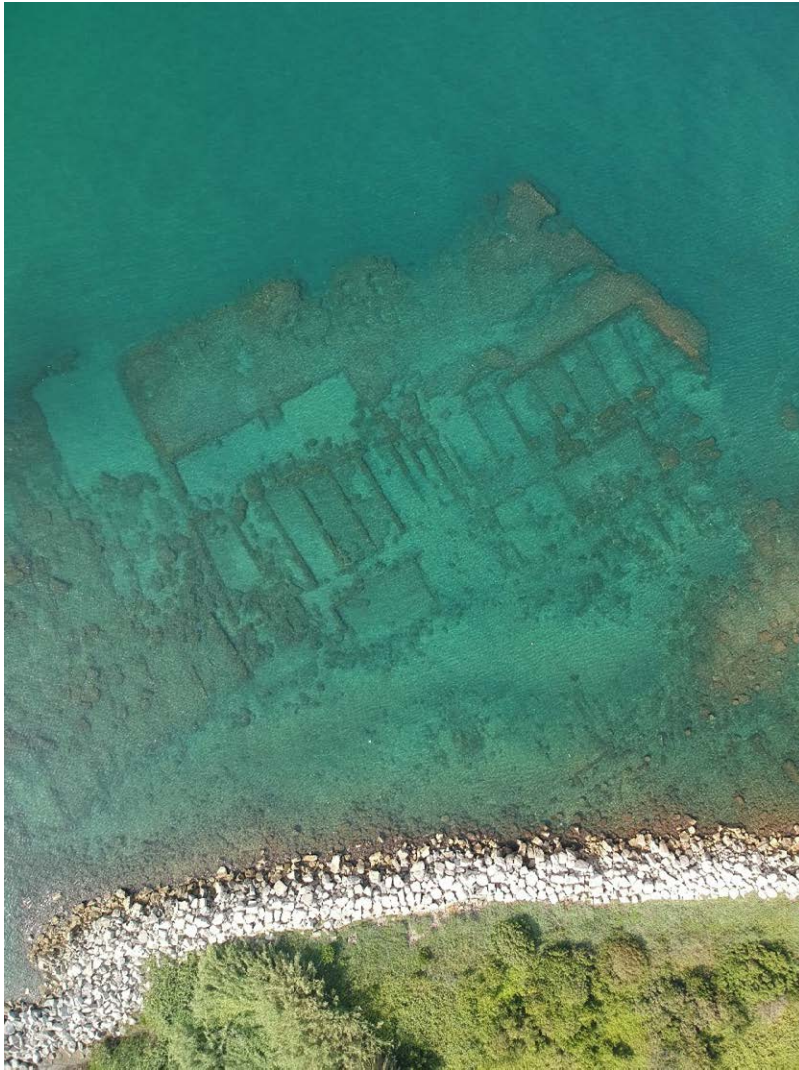


Figure 3. The *vicus Lartidianus* from the sky.

Behind these structures, however, it was possible to recognize a structure in *opus reticulatum* only partially outcropping, which can be interpreted as a corner of the lost sanctuary of the Nabataeans. The sanctuary constitutes a surprising discovery of the last century, almost totally forgotten, it was created by merchants from the East, who had their trading base in the harbour, and was built as a Roman building, with a dedication to Dusares, their god. The site was discovered by divers who recovered altars and inscriptions, but it was never excavated and has never been relocated until today.

Confirming this hypothesis is the discovery, still *in situ*, of a large marble altar characterised at the top by a series of eight rectangular holes in which aniconic betili were housed (Figure 4). The discovery of the altar is very important because it provides very interesting data on the number of housings for the betili, which was not the same for all the sanctuary's altars: so far only one had been found, preserved

in the National Archaeological Museum of the Phlegraean Fields and known as the ‘high altar’¹¹, which had seven housings.¹²

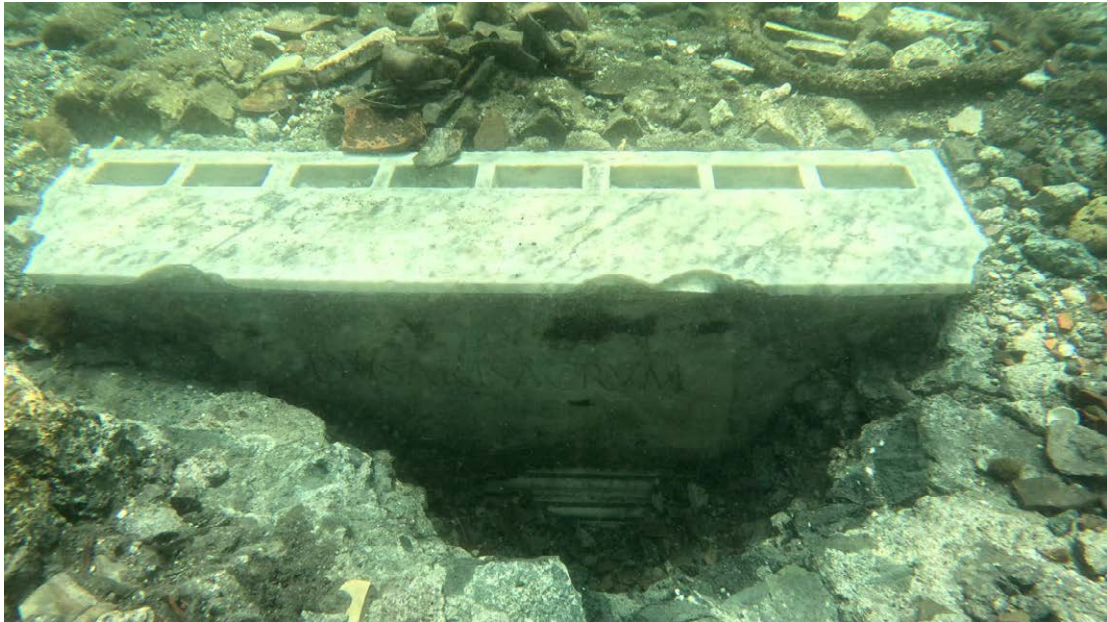


Figure 4. The altar of the Nabataean temple, still *in situ*.

On the other side of the *ripa Puteolana*, the *vicus Annianus* was investigated. The sector appeared characterized by a linear sequence of 12m thick quays in a good state of preservation. It is precisely the state of preservation and the different traces of reconstruction observed that could allow for a better historical reconstruction of the interventions implemented by the population to respond to the bradyseismic events that struck the Phlegraean coastline and thus guarantee the full functioning of the harbour until Late Antiquity.¹³ Particularly interesting is the presence of a massive wall built on the top of the original quay, to protect the harbour against the effects of the sea, that evidently had reached a

¹¹ AE 1971 = EDR075110.

¹² During the publication process of this text, a campaign has been specifically dedicated to the sanctuary and offered the possibility of reconstructing the planimetry of two rooms of the temple, with altars and inscribed slabs still in situ. The analysis of the site, moreover, offered surprising data on the phases of the building, that was created in the 1st century BC and apparently was abandoned very quickly in the first decades of the 2nd century AD, after one big renovation: probably the abandon of the sanctuary, that served as a place of worship but also as a strategic center for long distance trade of precious goods from the Indian Ocean, through the deserts of Arabia and the ports of Gaza and Alexandria in Egypt, was linked with the sudden conquest of the Nabataean space by the Emperor Trajan in AD 106; the Arabian campaigns of the *optimus princeps* led to the creation of a new province, the *Arabia Petraea*, and erased completely the autonomy of the Nabataeans in maritime trade, eliminating thus also the reasons at the base of their strategic post in the port of Puteoli. On this subject, see Stanile *et al.* 2024a.

¹³ This area is the same one that was partially addressed in Stanile 2021.

new level because of bradyseism; the wall was built, apparently, in the late 4th century, when most of the building in the *vicus* were practically at the limit or partially under the sea level, and is perhaps the physical trace of the intervention by the Emperor Theodosius mentioned in a couple of inscriptions dating back to the year AD 394.¹⁴



Figure 5. The granaries in the *vicus Annianus*.

As in *Vicus Lartidianus*, here too, behind the quaysides, there are *horrea*, but in this case we can interpret them as granaries (Figure 5), rectangular in shape, narrow and elongated (27x7m), in several rows. The structure of these rooms is handed down by ancient sources, as well as by the width of the walls (1.20m in the best-preserved sections). As described by epigraphy and the Puteolan archives of the Sulpicii, they could rise up to two or three levels, they were directly managed by the *annona*, and in some cases rented out to private entrepreneurs who accumulated great wealth by storing grain and selling it in

¹⁴ See now Stefanile 2025, also for the other archaeological evidence of the bradyseism in the region.

times of scarcity. In contrast to the docks, the *horrea* appear considerably damaged, as no structure has preserved the upper levels.

Perhaps the most interesting discovery emerged from the exploration of the sector between *vicus Lartidianus* and *vicus Annianus*. Here, in fact, a peninsula was identified, 40m from the eastern limit of the *horrea* of *vicus Annianus* and 165m from the western limit of the buildings of *vicus Lartidianus*. This peninsula, never seen before, with the remains of a building filled with marble, with four columns on the seabed (two with smooth shafts and two twisted), with an underwater floor full of *sectilia* and with an impressive hexagonal base possibly belonging to a signaling monument (Figure 6).

Only further research will shed light on the nature of this new building, which appears, however, to be linked to the harbour administration and perhaps to the port activities connected with the arrival of fleets from Egypt (the *naves Alexandrinae* mentioned by Seneca and other sources).



Figure 6. The *Penisola Mediana*.

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New Thoughts on the Land and Sea Routes of Ancient Knidos

Derviş Ozan Tozluca¹

Abstract

The ancient region of Knidos extends from the Bybassos Strait to the Tekir Cape at the tip of the peninsula. Due to its location on the sea trade routes, the Knidos region is strategically important. This slender and elongated peninsula has a challenging and scattered topography. The topographic features of the Knidos region have led to the dispersed settlement units on the peninsula being situated at distant locations from one another. While the settlement areas on the peninsula developed and artifacts increased during the Geometric and Archaic periods, the construction activities during the Classical period were relatively stagnant. From the first half of the 4th century BC, construction activities in the Knidos region noticeably increased.

In our study, we will examine the significant discovery centers in the Knidos region and their connections, and specifically discuss the impact of the increased construction activities during the first half of the 4th century BC on the land and sea routes of Knidos.

Introduction

The ancient Knidos region, as described by Herodotus (1. 174, 2-3), encompasses the slender, elongated, and rugged peninsula extending from the Bybassos Strait to the western tip, which is known today as the Datça or Reşadiye Peninsula. The expression 'Steep Knidos' accurately describes the city's topographic feature, as mentioned in the Homeric Hymn to Apollo (*Homeric Hymnos* 3, 30; Evelyn-White 1932: 327). The ancient Knidos Territory is bordered by the Keramaikos Gulf to the north, the islands of Syme and Rhodes to the south, and the island of Kos to the west. Herodotus states that the length of Knidos lands is 5 stadia, and the peninsula extends from the Bybassos Gulf to the westernmost Cape Triopion (Doksanaltı 2006: 10).

The Datça Peninsula, where the ancient Knidos Territory is located, is an elongated landmass of approximately 65km in length. At its widest point, the peninsula measures 15km, and at its narrowest, it is 0.6km wide (Figure 1) (Tuna 1983: 14-5). Considering the geographical and archaeological characteristics, the peninsula can be divided into three main regions. The first region starts from Balıkaşiran/Bencik, located at the easternmost and thinnest part of the peninsula², and extends to

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² During the Late Archaic Period, the pressure of the Persians on the western coasts of Anatolia increased, and the Persian commander Harpagos took action to seize the coastal regions of Caria. According to Herodotus, in response to the approaching Persian threat, the people of Knidos intended to turn the Knidos Peninsula into an

Datça/Kızlan Plain. The second region is the Datça Plain, and the third region encompasses Zeytincik village to the furthest point of the peninsula, Knidos. The first region of the peninsula generally has rugged topography with shrubs and wooded areas. The western part of the peninsula, on the other hand, features mountain ranges reaching heights of up to 1000 metres (Tuna 1983a: 14-6).

The western part of the Datça Peninsula is shielded from harsh winds by the high mountains in the region. Starting from April, the wind regime worldwide shifts from north to south, and the influence of the increasing etesian (Meltem) winds during the summer months is significantly reduced by these high mountain ranges (Bresson 2011: 398-9). Unlike the Knidos Peninsula, the Gökova Gulf located to the north of Knidos does not have a protective land mass. Thus, the topographic features of the peninsula reinforce Knidos' advantageous position in terms of ancient maritime routes.

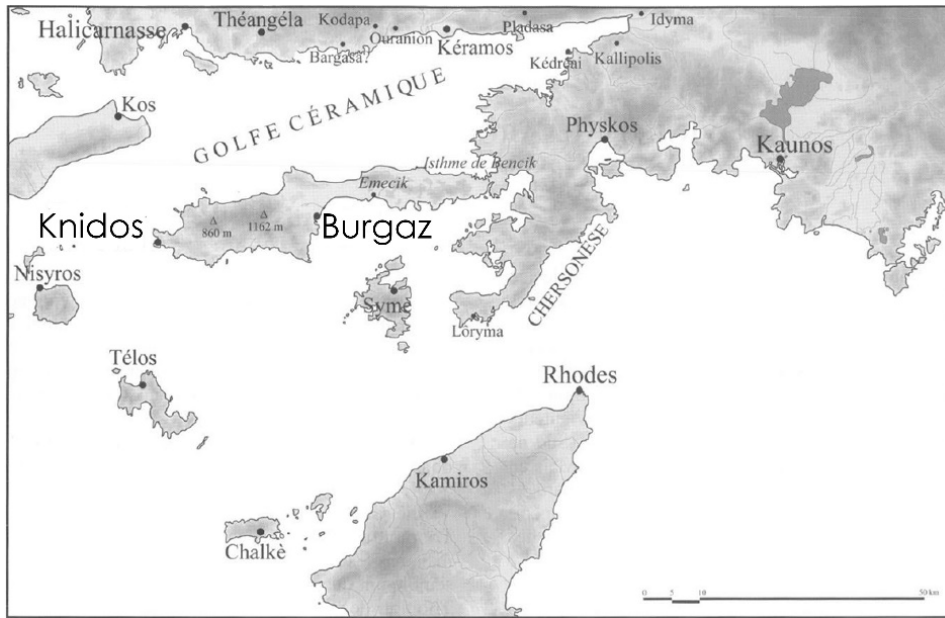


Figure 1. Datça/Knidian Peninsula and its surroundings (After Bresson 2011: Fig. 1).

Knidos Territory

The Knidos Territory, including Knidos, the Burgaz Archaeological Site, and the Emecik Apollo Sanctuary, has been the subject of research for many years³. Surface surveys conducted by G. Bean and

island by opening a canal at its narrowest point (1. 174). However, as various calamities and misfortunes befell the Knidians working on the canal, they sought the advice of the Delphic oracle Pythia. Upon receiving a negative response, the Knidians abandoned their efforts and surrendered to the Persians (Bruns-Özgan 2002: 10-1; Tuna 2012: 13). Some researchers have suggested that the location where the Knidians carried out this famous endeavor was the Balıkaşiran/Bencik area (Fraser and Bean 1954: 62-6; Deamand 1989: 230).

³ Excavations have been conducted in Knidos under the leadership of various archaeologists. Sir Chr. Thomas Newton from England led the excavations between 1857 and 1859, followed by I. Cornelia Love from the United States between 1967 and 1977. From 1988 to 2006, Prof Dr Ramazan Özgan took charge of the excavations, and

M. Cook in the 1950s, research carried out by Numan Tuna in the 1980s, and excavations of ceramic workshops in Reşadiye between 1986 and 1992, conducted by Numan Tuna and Jean-Yves Empereur, have contributed to our knowledge of the ancient Knidos Territory (Tuna 2012: 41-2).

Approximately 9km east of the region, in the Balıkaşiran area, lies an ancient marble quarry, which is one of the most significant discoveries in recent years. The quarry consists of two sections and has a total size of approximately 70x30 metres (Figure 2). The quarry's excavation level is around 12 metres. Adjacent to the quarry, there is a dried-up stream bed on a hill approximately 70-80 metres high (Doksanaltı *et al.* 2023: 417-8, Fig. 1-4). The quarry is located about 900 metres from the sea. It is understood that the marble from this quarry was used in structures such as the Dionysus Stoa, Symmachos Heroon, and the Heroon on Liman Street in Knidos. The initial period of the quarry's use is still unknown, and geophysical, mineralogical, and petrographic studies are ongoing. Whether the quarry was used in the Burgaz and Emecik Apollo Sanctuaries is also yet to be determined. A tomb inscription found in the Alavara Ancient Marble Quarry indicates that it was intensively used until at least the 4th century AD (Doksanaltı *et al.* 2023: 418, Fig. 5).



Figure 2. General view of Alavara Ancient marble quarry.

In the vicinity of the Alavara area, there are remnants of an ancient road extending approximately 100 metres, as well as a few small settlements. Moving westward, the Emecik Apollo Sanctuary and the

since 2012, Prof Dr Ertekin M. Doksanaltı has been leading the efforts. In addition to the Knidos site, archaeological excavations were carried out in the Burgaz Archaeological Area between 1993 and 2017 under the supervision of Prof Dr Numan Tuna. From 1998 to 2006, excavations were conducted at the Emecik Apollon Sanctuary. Since 2020, the excavation work at Burgaz and Emecik has once again been led by Prof Dr Ertekin M. Doksanaltı.

Asartepe Castle in the Sarı Liman area, along with other archaeological sites dating from the Classical Period to the 1st century BC, can be found (Bean and Cook 1952: 172; Tuna 1983b: 386; 2022: 18). According to Numan Tuna, the Emecik Apollo Sanctuary was used for ceremonial and sacrificial purposes from the Geometric Period to the Classical Period (Berges 2002: 112-3). After the construction of the Doric temple in the center of the sanctuary in the 4th century BC, the sanctuary continued to exist until the Roman Imperial Period. A basilica-style church was built in the 5th century AD and remained in use until the Arab invasions. After the Arab invasions, the sanctuary was completely abandoned after the 13th century AD (Tok 2022: 195).

Burgaz Archaeological Site is located east of modern Datça settlement. It is a well-organised, orthogonal planned settlement dating back to the Archaic and Classical periods (Tuna 2012: 63). The city walls and harbour walls of Burgaz, which are poorly preserved, were constructed during the same period and program as Knidos, according to initial assessments (Figure 3). Burgaz has four different harbours. Underwater excavations conducted in Harbour L1 have provided the earliest date between the 8th and 6th centuries BC based on organic material obtained and analysed using C-14 dating. However, ceramic findings are quite rare in this layer. Burgaz Harbours were intensively used in the 3rd and 2nd centuries BC (Green *et al.* 2019: 107-8).

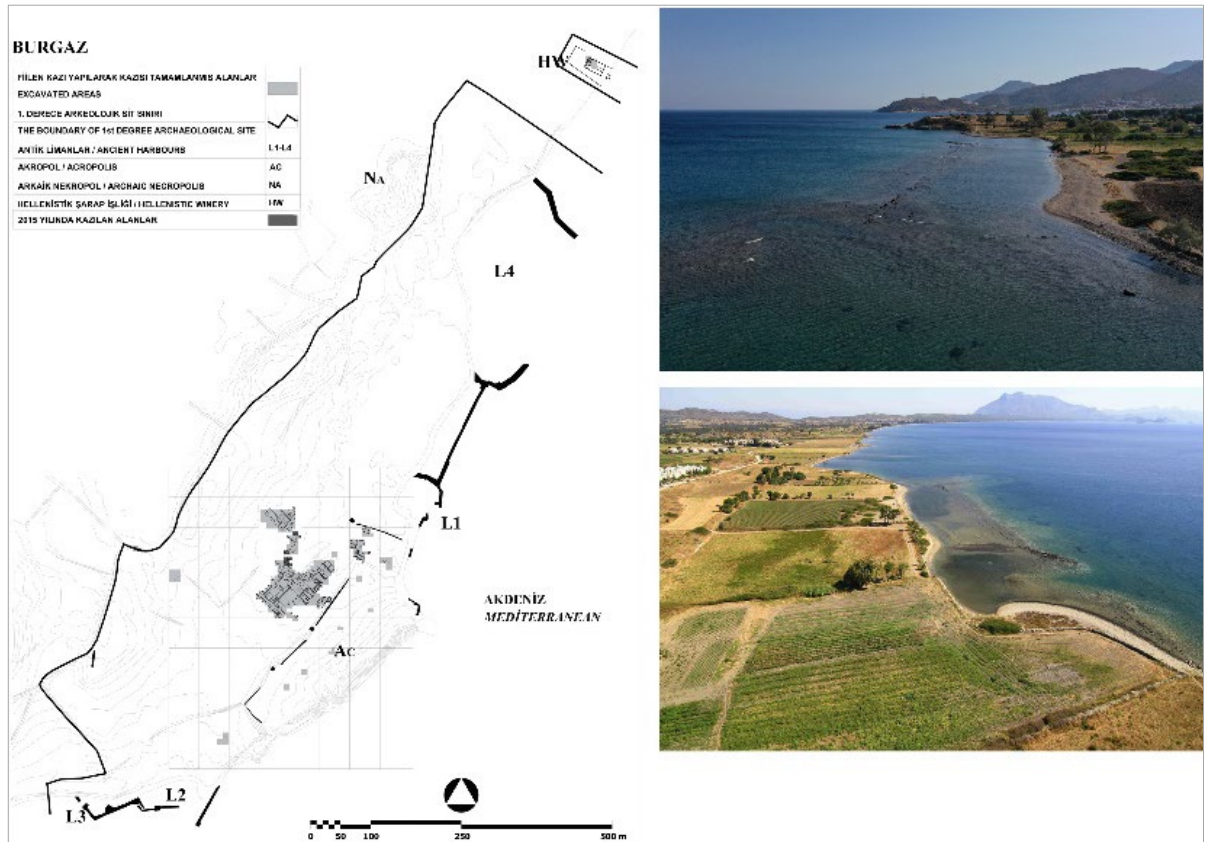


Figure 3. Burgaz Archaeological Site and its harbours (After Tuna 2012).

Topographically, the Datça Peninsula is quite rugged. The modern Datça peninsula, which includes the Burgaz Archaeological Site, has one of the largest and most fertile agricultural lands. Knidos began to increase wine production from the 4th century BC, and production intensified between the 3rd and 1st centuries BC (Tuna 1983a: 57; 1990: 350-1; 2012: 32). As a result, wine production workshops, especially ceramic workshops, were established in the Datça plain, particularly on slopes that provided new agricultural areas. The selection of locations for ceramic workshops took into account proximity to clay deposits and agricultural lands (Tuna 1990: 367). The production of amphorae in the Datça-Reşadiye region has been determined to have taken place between the 4th century BC and the 6th century AD (Tuna 2012: 41).

During the Late Antique period and following the Arab Invasions, the coastal area became unsafe, leading to the construction of new fortresses and settlements in more inland and elevated areas. One of these is the Old Datça Fortress. The fortress measures 120x150 metres. Another fortress, Hızırşah Fortress, which was used in a similar period as the Eski Datça Fortress, has dimensions of 100x100 metres. Yarıkdağ Fortress, located south of the deep valley that allows passage from the eastern to western hinterland of Knidos, approximately 3.5km west of Hızırşah Village, is one of the important late period fortresses in the region. The fortress measures 280x160 metres. The cave-church structure with wall paintings depicting Theotokos Mary, located approximately 100 metres below the fortress, dates back to the 9th to 11th centuries AD (Figure 4) (Özyurt-Özcan 2010: 383-4). The fortress must have been actively used during this period. The center of the fortress houses three Ottoman-era cisterns.



Figure 4. Papazini and Yarıkdağ Castle.

Another area where archaeological finds and settlements are located is the Mesudiye shores. The initial phase of the small fortress here should date back to the first half of the 4th century BC. However, the early phase was largely destroyed during the Late Antique period when the fortress was renovated. Mesudiye Fortress is double-sided, with the interior consisting of rubble stone and compacted earth fill. Irregular weft/tie stones can be seen in the construction of the wall body made in emplekton technique. Polygonal and trapezoidal blocks were used in the wall body. In terms of wall construction technique, Mesudiye Fortress bears a great resemblance to Kumyer Fortress and Knidos Kap Krio walls, which we will discuss in detail later (Büyüközer 2020: 176, Fig. 12). Therefore, the walls of Mesudiye Fortress can be dated to a period around the 2nd quarter of the 4th century BC (Büyüközer 2020: 178-9).

One of the most important structures/settlements in the western part of the Knidos Hinterland is Kumyer Fortress (Figure 5). The fortress is located approximately 11km east of the Knidos Ancient City. The area is roughly at the center of the Kumyer Plain, which is the second largest agricultural land within the Knidos hinterland. The fortress, consisting of inner and outer fortifications, measures 1km in the north-south direction and 0.6km in the east-west direction. The outer wall line has two entrances and two towers. The double-faced walls of the fortress are filled with rubble stone and soil. The emplekton⁴ technique was used in the construction of the walls, and irregular weft/tie stones can be observed.⁵ The inner wall line is similarly constructed with a double-faced technique.

The walls of Kumyer Fortress bear similarities to the walls of Knidos and Halicarnassus (McNicool 1997: 19-21, Pl. 1-4; Pedersen 2010: 281-2, Fig. 5-6; Büyüközer 2020: 167). The construction of the fortress was most likely carried out as part of a similar construction program as Knidos. The construction of the walls of Kumyer Fortress should have been completed in the 2nd quarter of the 4th century BC, similar to the Hecatomnid dynasty period in the Karia region and the construction activities seen in Knidos walls.⁶ G. Bean and M. Cook, who visited the region in the 1950s, date the fortress back to the Archaic period based on the Archaic period inscriptions and painted ceramics found in the area (Bean and Cook 1952: 181-2). Kumyer Fortress, along with the small settlements and workshops located in the Kumyer Plain, was likely used to protect and observe the roads, as well as to serve as a refuge in case of any attack.

⁴ For detailed information about the Emplekton technique, please check (Pedersen 2019: 1-10; Nossov 2009: 61; Lawrence 1979: 214-5; Vitruvius 2. 8. 7; Karlsson 1992: 67-85; Tomlinson 1961: 133-40).

⁵ It is a technique of masonry created by placing narrow and vertical blocks horizontally in a continuous wall course. This creates a tighter bond in the walls due to the presence of these vertical blocks. This technique, using weft or tie stones, was first employed in the city walls of Syracuse in Sicily during the early 4th century BC. For more detailed information, refer to (Karlsson 1994: 42-143; Karlsson 1992: 67-105). In western Anatolia, this technique can be observed in the defensive structures constructed during the Hecatomnid Dynasty in the first half of the 4th century BC.

⁶ Halikarnassos: (Pedersen 1994: 215-36; Pedersen 2010: 269-316); Labraunda, Priene: (Ruppe 2010: 141-63); Alinda: (Konecny and Rugendorfer 2014: 709-46); Alabanda: (McNicoll 1997: 31-8); Knidos: (Gerkan 1924: 117-8, Fig. 10; Büyüközer 2013: 140-7); Kumyer: (Pimouguet-Pédarros 2000: 333).



Figure 5. Kumyer Castle.

There is a bridge located 1km west of Kumyer Castle, which is known as ‘Uluçay’ by the local people (Figure 6). The bridge, known as Çeşmeköy Bridge, was first documented by Mauri in the 1920s and later visited by G. Bean and M. Cook. The bridge, covered with dense bushes today, has a measurable length of 53 metres and a width of 8.5 metres. It was constructed using the corbelled bridge technique, with horizontal, long, and slender limestone blocks. The inner part of the bridge is filled with rubble stone and earth⁷.

When we look at the wall structure of the initial phase of the bridge, it is noteworthy that the header/stretcher bond is not used in the wall. This technique is created by placing narrow and vertical blocks in the horizontally continuing wall courses. It was first used in the city walls of Syracuse in the early 4th century BC (Karlsson 1992: 67-105; 1994: 142-3). In the subsequent period, starting from the 2nd quarter of the 4th century BC with the Hecatomnid Dynasty, it began to be used in western Anatolia. This technique, preferred in the construction of large-scale structures such as defense structures and

⁷ In bridges of this type, created by gradually raising the blocks and giving the illusion of an arch, the weight of the upper tiers is transferred to a lower block along the axis of inclination, preventing the protruding blocks of the upper row from breaking and getting damaged (Bougia 1996: 346 and 609, Pl. 129-d). A similar technique can be observed in the Mycenaean period bridges of Knossos, Chavos, Kazarma, Galousi, the city walls of Late Classical Period Messene, and the Akragas Bridge (Durm 1910: 210, Fig. 183). The similarity between the tunnel structure constructed with the overlapping technique found in Eretria and the Çeşmeköy Bridge is noteworthy (Nakassis 2000: 364-5).

terrace walls, was gradually used in the masonry of many buildings over time. In the nearby city of Knidos, which has a close connection with the bridge, the use of header/stretcher bond is known in many structures from the Classical and Hellenistic periods. Similarly, this technique is also observed in the walls of Kumyer Castle, which was built in the Classical Period.



Figure 6. Çeşmeköy Bridge.

In the Karia region and the general Knidos hinterland, a new urban development started under the dominance of Hecatomnus in the 4th century BC. This period, known as the 'Ionian Renaissance,' manifested itself in monumental architecture and defensive architecture (Büyüközer 2023: 68). However, the notable use of header/stretcher bond in the structures built during the Hecatomnid period is not observed in the Çeşmeköy Bridge. Additionally, there is no comparable example of the wall masonry seen in the Çeşmeköy Bridge within the entire hinterland. Therefore, the bridge was most likely built before the 4th century BC, perhaps in the 5th-6th centuries BC. The 'Yaka Lion,' which is dated to the end of the 6th century BC and the beginning of the 5th century BC and is believed to belong to a monumental tomb, is important for the presence of finds from this period in the region (Doksanaltı 2020: 17).

When heading west into the hinterland, at the intersection of Yazı and Belen villages, you will come across a castle called Belen Castle, which is likely from the medieval period. The castle is located in a strategically important position, overlooking a part of Değirmenbükü and Kumyer Plain. Just southwest of the castle, in the Saranda Mevkii, other ancient remains are observed in the dried riverbed coming from Yazıköy. In this area within the Knidos East Necropolis, there is a polygonal wall, most likely a bridge abutment, located just below the modern highway (Figure 7a). This bridge abutment has a width

of 11.98 metres and a preserved height of 1.99 metres, and it then curves towards the west and continues in that direction for another 49 metres. This bridge abutment and wall were most likely built in the 4th-3rd centuries BC to control the nearby river and improve the region (Newton 1863: 522; Bean and Cook 1952: 181).

Within the Knidos East Necropolis, there is a circular planned structure located on the northern slopes of a cove known as Bağlarözü by the local people. The walls of the structure, made of local bluish-gray limestone, feature polygonal blocks. The double-faced walls have a thickness of 1.2 metres. The structure consists of two circles, one inside the other. The inner circle has a diameter of 11.2 metres, while the outer circle has a diameter of 18.1 metres. The structure has a preserved height of 5.5 metres. There is no use of header/stretcher bond in the walls of the structure. The function of the structure is still unknown, but due to its proximity to the ancient road leading to Knidos and its commanding position overlooking the sea to the south, it may have been used as an observation tower. The structure was most likely built in the late 5th century BC or early 4th century BC, before the Hecatomnid construction program (Pimouguet-Pédarros 2000: 121-2).

Another structure found in the Bağlıbelen area is Saranda Castle (?) (Figure 7b). Built on a steep and rocky elevation, the castle is approximately 100 metres wide in the east-west direction. Constructed in a highly dominant position facing north and south, the structure was likely used as an observation point during the Late Antiquity period.⁸

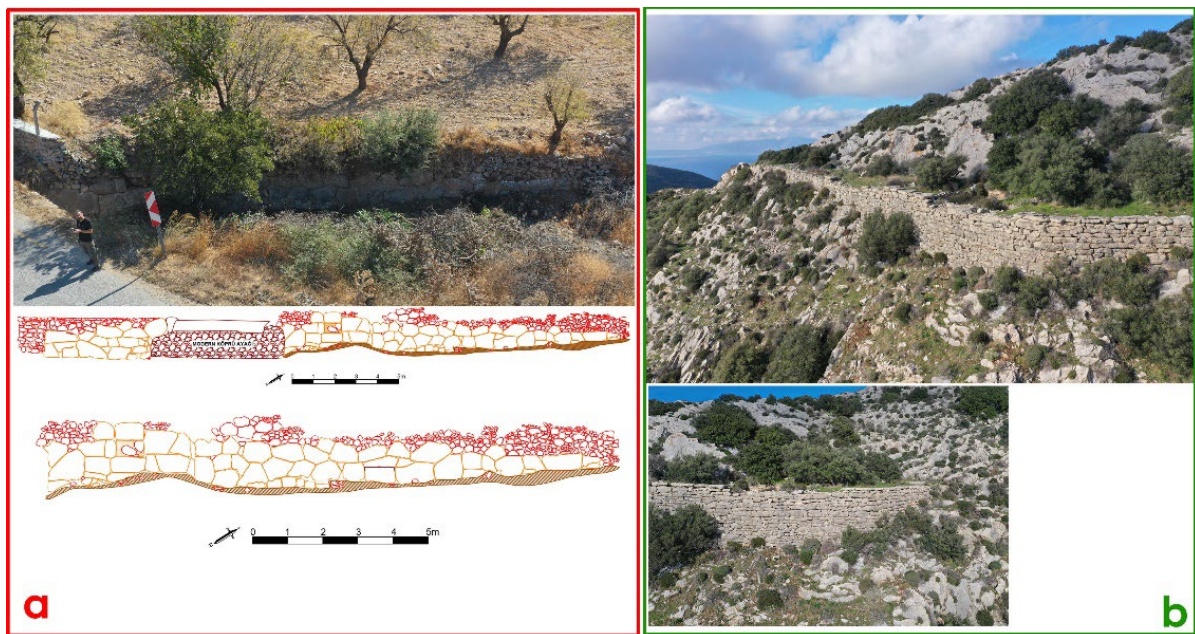


Figure 7. a) Ancient Bridge (?) from Saranda/Knidos. b) Saranda Castle (?) or platform.

⁸ In their research, Bean and Cook found ceramics that they dated to the Late Hellenistic - Roman Imperial period (Bean and Cook 1952: 181).

From the Saranda Mevkii onwards, the tombs belonging to the Knidos East Necropolis become more concentrated. Especially in the vicinity of Domuz İni and Gırap Mevkii, the tombs are visible even on the surface. Excavations carried out in the Gırap Mevkii resulted in the identification of the ancient road, believed to have been used during the Roman Imperial Period (Doksanaltı *et al.* 2021: 77, Fig. 7). The ceramic workshops found in the Knidos East Necropolis were engaged in the production of fine ceramics required by the city's domestic and external markets between the 2nd century BC and the 1st century AD (Love 1967: 139; Kassab and Tuna 1991: 54; Tuna 2010: 39-40).

In the northern territory of Knidos, in areas such as Değirmen Bükü, Barkas Mevkii, and İskandil Mevkii, various remnants of the ancient period have been identified, including the northern necropolis of the city, Late Antiquity workshops, tumulus tomb (Büyüközer *et al.* 2022: 233, N. 102), travertine stone quarries, and a Roman-era road (Doksanatlı *et al.* 2022: 379, Fig. 5).

Land and Sea Routes of the Territory

Knidos territory witnessed a construction activity in the first half of the 4th century BC, which had an impact on the entire peninsula. With this new construction activity, significant production areas in the Knidos hinterland were protected. Important positions along the land and sea routes were secured with the construction of castles and watchtowers. The challenging topography of the region connected various sized and functionally different production areas within the hinterland to both the domestic and external markets. Factors such as proximity to raw materials, and land and sea routes were taken into account when selecting these production sites. The transport burden of the Knidos hinterland was predominantly carried by sea routes.

Looking at the distribution of fortified positions on the peninsula, the maritime route of the Knidos hinterland started from the Karia Chersoneses in the east, at the Sarı Liman and Asar Tepe coastal areas. It then continued to Burgaz, the most important production area in the hinterland. From there, the route followed along the coastline, passing through Mesudiye Castle, Palamutbükü, and finally reaching Knidos. All of these routes were under the surveillance of the Classical Period castles mentioned in detail above. Shipwrecks identified along the coastline are of great importance in establishing the southern sea route. The northern part of the peninsula starts from Alavara, an important marble quarry, and continues through Körmen Limanı, Murdala Bay, Değirmenbükü Bay, and finally reaches the furthest point of the peninsula, Knidos. The travertine stone quarry located in Değirmenbükü meets an important need of the city.⁹

⁹ Preliminary analyses and evaluations have shown that the marble quarry identified in Alavara has a very high-quality structure. The results of the archaeometric studies on the Ancient Marble Quarry of Alavara are being prepared for publication. We do not yet know whether the marble extracted from there was used in Burgaz or Emecik.

The land route of the hinterland follows a similar path, within topographic constraints, as the modern Datça-Marmaris and Datça-Knidos roads. The earliest traces of the land route can be observed in the Alavara region. The mainland road connects centers such as Emecik and Burgaz. It must have also passed through important production centers in the Datça plain. The road likely passed through the Reşadiye region, where workshops and ateliers were concentrated. It continues along a narrow and deep valley between the modern villages of Hızırşah and Zeytincik, reaching Kumyer Castle and Çeşmeköy Bridge. From there, it continues towards Yazıköy. From Yazıköy, the road splits into two directions. One leads to the northern part of the hinterland, towards Değirmenbükü Bay. The road, running along the northern coast of the region, reaches the entrance of Knidos' northern walls, where the city gate is located.

Evaluation

Current archaeological data demonstrates that the earliest findings proven in the Knidos Peninsula date back to the Late Helladic period. From the Geometric period onwards, findings from different and distant points of the peninsula start to emerge. The spread of artifacts increases during the Archaic and Classical periods, reaching its peak during the Hellenistic period. Based on the research conducted by G. Bean and M. Cook in the 1950s on the Datça Peninsula, it has been suggested that Knidos was relocated from the Burgaz area of Datça to its current location, taking into account the synoikismos movements in Kos and Rhodes and the urbanization project of the Hecatomnids. It has been proposed that this relocation was completed by 330 BC (Bean and Cook 1952: 206-7, 210-2; Tuna 2012: 14-5). N. Tuna's surface survey in the Datça Peninsula identified two main settlement periods in the peninsula. The first represents settlements from the 4th century BC and earlier, represented by 18 settlement sites. The second period dates back to the 4th century BC and beyond, comprising a total of 40 settlement units (Tuna 1983a: 128). However, recent excavations and research require the revision of certain aspects of these proposals.

The pre-Classical period findings uncovered during the I.C. Love excavations in Knidos have been disregarded by researchers due to their lack of publication (Tuna 2012: 27). In recent years, excavations and research have led to the discovery and evaluation of many archaeological artifacts dating back to the 8th century BC and later in Knidos.¹⁰ From the Geometric and Archaic periods onwards, the western part of the peninsula, including Tekir Burnu, Datça at the center, and Emecik in the east, represents

¹⁰ The bull figurines found in various parts of the city and showing a similar repertoire to the examples in Emecik are some of the pre-Classical period findings in Knidos (Tozluca 2016: 47-51; Tozluca and Doksanaltı 2019: 223). In addition, the terracotta figurines found in the Round Temple Terrace and evaluated by Mustafa Şahin present a wide repertoire associated with different cults from the second half of the 6th century BC to the Hellenistic period (Şahin 2005: 72; 2021: 200-3). In addition to these, the Apollon Karneios Temenos, the relief dating back to the late 5th century BC uncovered in the Propylon structure, and the clothed kouros statue dating to the mid-6th century BC found in the Stoa are significant findings in recent years. These findings are currently being prepared for publication.

three main centers with contemporary and different patterns. The suppression of the Ionian Revolt by the Persians in 494 BC undoubtedly led to the weakening of Ionian power and the decline of the art that developed in its own style during the Archaic period (Slawisch 2019: 3-5). As a result of increased Persian pressure, construction activities in Western Anatolia came to a halt (Cook 1961: 90-101; Pedersen 2020: 220-3; Büyüközer 2022: 68). With the Hecatomnids taking control of the region, construction activities increased in the Knidos territory.



Figure 8. General view of Knidos and its harbours.

Fortification of Knidos, Kumyer Castle, Mesudiye Castle, and the walls of Burgaz Harbour indicate a construction program encompassing the entire peninsula starting from the second quarter of the 4th century BC, all of which were likely built in close proximity to each other. The late 5th century BC and early 4th century BC were politically and militarily eventful for Knidos (Figure 8). According to Thucydides (3. 85), it can be inferred that Knidos was not surrounded by walls between 412/11 BC. During the Peloponnesian War, Knidos suffered attacks from the Athenians as a result of Knidians switching sides to the Spartans. Under the leadership of Conon, the Athenians defeated the Persians and Spartans near Knidos in 394 BC (Diodorus 14. 94-7, 99; Xenophon 4. 8, 17; Doksanaltı 2006: 14; Tuna 2012: 14). Therefore, as a result of the Peloponnesian War, the Knidians must have taken new steps to defend the city and the entire territory.

Numan Tuna's studies have shown that only 20% of the Datça Peninsula is suitable for agriculture¹¹. As mentioned before, the most important agricultural areas of the Datça Peninsula are the Datça Plain and later the Kumyer Plain. Kumyer Castle must have played a significant role in protecting the Kumyer Plain and *chôra*, as well as controlling the land route to Knidos. In addition to its surveillance function, Mesudiye Castle is excellently positioned for monitoring the southern sea routes. By undertaking construction activities to establish significant production centers, the Knidians protected their territory during the first half of the 4th century BC.

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¹¹ N. Tuna suggests that the peninsula's wheat production can only feed 12,000 people (Tuna 1983: 55; 2012: 31).

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Trade, Ceramics and Economy

Archaic Period Ionian Non-Figurative Ceramics

Fatma Bozdağ¹

Abstract

Nonfigurative wavy-striped ceramics from the Archaic period are found in a wide geographical area. Samos, Klazomenai and Miletus are considered to be the most important production centers in Ionia. It has been demonstrated that this type of pottery was produced in Ionia in the 7th and 5th centuries BC. Among the painted ceramics of the Archaic period, simple and cheaper vases without figures, mostly consisting of anonymous forms for daily use, were produced. Because of these characteristics, they are considered different from intensively traded products and are generally accepted as the local production of the city where they are located.

The Ionia region includes the western and southern parts of İzmir, the western part of Aydın, and the Greek islands of Chios and Samos. Until the mid-20th century, Samos, Miletus, Klazomenai, Smyrna and Miletus were the cities in the Eastern Greek region of Anatolia where vases belonging to this ceramic group were mainly recovered.

Discussion

The Ionia region includes the western and southern parts of İzmir, the western part of Aydın, and the Greek islands of Chios and Samos. The Ionians were an explorer, sailor, merchant and artist people who settled on the fertile lands fed by the Büyük Menderes and Gediz Rivers on the shores of the Aegean Sea. In terms of governance, there were city structures that were independent of each other. Since they were a seafaring people, they traded by transporting goods to many Mediterranean ports.

Non-figurative wavy lined ceramics, which we encounter throughout the Archaic period, appear in a wide geographic extent. Samos, Klazomenai and Miletos are considered to be the most important production centers in the Ionia region. In the studies carried out in the Ionia region we see that such ceramics were produced in the 7th and 5th centuries BC. In the Archaic period, simple and cheaper vases were produced among the painted ceramics, consisting of anonymous forms, mostly used in daily use, without figures. Due to these features, they are seen as different from the products that are heavily traded and are generally accepted as the local production of the city where they are located. Ceramics of this period are generally simple decorated vases with bands, including simple rays, tongue motifs, checkerboard, wavy line, horizontal 'S' motifs.

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During the excavations carried out until the middle of the 20th century, Samos, Miletos, Klazomenai and Smyrna in the East Greek region of Anatolia were the cities where vases belonging to this ceramic group were mainly obtained. The common features of the vases can be summarised under four headings:

- 1) They are composed of amphorae, hydria, craters and oinochoe with similar forms
- 2) The neck, shoulder and abdomen parts of the vases are separated from each other by horizontal bands
- 3) The application of a certain decorative scheme, in one of these areas - or a few of them - with wavy lines and/or horizontal S motifs
- 4) They have similar paste and paint structures, which are coarser than figural ceramics in terms of workmanship.

While the common features discussed under the four headings are the basic criteria of all researchers in defining the group, different features are highlighted in how they are named. Accordingly, those who foreground their widespread and anonymous nature name them 'common ware'; those who find their usage areas noteworthy 'Gebrauchskeramik-ware'; those who consider simple curved ornaments as determinant have used names such as 'Reifenschmuck', 'decor lineare', and 'pots with simple decoration'. Although the nomenclature differs, the researchers examining the material have made the greatest effort to examine the origins and production places on the basis of the paste structure, taking into account the traditional classification of figured ceramics. In early studies, it was assumed that the ceramics found in the main cities were the output of these centers producing figured ceramics. According to this approach, Rhodes and Miletos were accepted as the production sites of the ceramics under investigation. The vases obtained from the colonies were assumed to have been transported from these centers, and their origins were examined based on the paste structure and similarities in form.

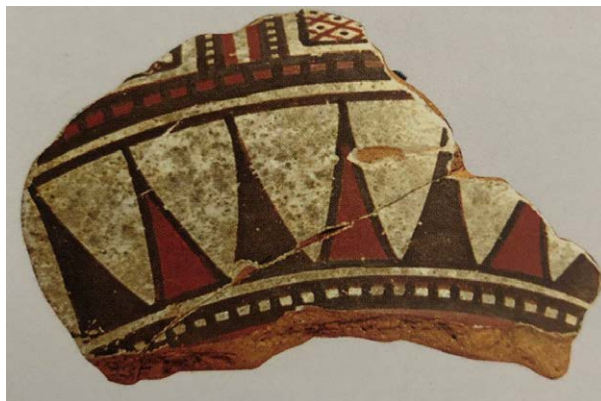


Figure 1. (After Kerscher 2007: Fig. 19).

In the north of the peripteros of the Temple of Artemis in Ephesos, a piece of pyxis with intense micaceous, red-yellow clay color was found during the excavation in 1989. The pyxis fragment, dated between 630-600 BC, has a cylindrical body narrowing towards the mouth. The outer surface has a dark

brown-red paint decoration on a white slip. There are slender 'ladder' bands painted in dark colors, and square inlays filled with diagonal lines and dots. An alternating black and red ray motif appears between two ladder motifs. The inner surface is reddish brown coated (Figure 1).

Another example was found in the Temple of Artemis at Ephesus in 1907 and exhibited in the British museum. It is a red-dark brown bowl dated between 620-600 BC. The bowl is decorated with red-black paint on a white slip. The outer surface of the rim fragment of the bowl is divided into squares bordered by a ladder pattern. A plain band appears in alternating red and black, then a series of squares in different sizes; the inside of the squares is filled with red crossed line and dark diamond motifs. On the inner surface are squares of different widths with light and dark decorations on the rim; the squares are surrounded by 'ladder' friezes. On the other hand, at the bottom is a ladder motif; a row of steps decorated with dots and a thin band are depicted (Figure 2).



Figure 2. Left, outer surface. Right, inner surface. (After *The British Museum, London: Bowl, 1907*).

We also see imitations of ceramics from the Ephesos group in the Daskyleion settlement. Although the ceramics in question are similar to the Ephesian group, they are simpler and careless. Bands of linear motifs are seen in both groups. The differences in the decoration workmanship among the ceramics are striking (Figure 3).



Figure 3. (After Kılınç 2019).

The amphora found at Clazomenai, dated to the 6th century BC, is red-black decorated on a white slip. A wavy line is elaborated on the neck of the amphora and a thick band on the body. There are thin tape strips towards the pedestal (Figure 4).



Figure 4. (After Uzun 2016).

Conclusion

Non-figurative ceramics from the Archaic period appear across a wide geographical area. In the Ionia region, such ceramics were produced in the 7th and 5th centuries BC. Among painted ceramics, non-figurative ones were simpler, cheaper vases used more for daily use. Due to these characteristics, they are generally considered to be locally produced in the city where they were found, as opposed to products that were heavily traded. These ceramics generally consist of vases with simple decorations such as bands, simple rays, tongue motifs, checkerboard patterns, and wavy horizontal 'S' motifs.

The forms produced in the archaic period ceramic production centers of the Ionia region generally consist of simple vessels such as bowls, skyphos, oinokhoe, kotyle, and cups. Generally produced in a non-figurative style, these vessels are simple vessels used in everyday life.

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Roman Period North African Imports at East Adriatic Underwater Sites

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Abstract

The article focuses on the analysis of finds that originate from north Africa that have been found at the East Adriatic underwater sites and can be dated to the period between the 1st and the 5th century AD. The research was focused on collecting all available data about the archaeological finds of African provenance recovered from the Croatian seabed. Majority of these finds refer to different forms of amphorae, then sigillata and cooking ware, and also other ceramic ware less plentiful though, oil lamps and building material. These finds were evidenced in different contexts such as shipwrecks, ports, docks and anchorages.

Although African ceramic finds were produced in a number of provinces, most finds originate from the province of Africa Proconsularis. Products transported from the provinces of Tripolitania, Cyrenaica, Mauretania and Aegyptus are far less frequent. Except for the fact that most of import originated from the region of the province of Africa Proconsularis, analysis of the finds has indicated that the import intensity changed over centuries. African amphorae became more common only in the mid-2nd century AD (variants Africana II, Tripolitana I and III), but the import of amphorae and products they contained reached the peak only in the 4th century C. Sigillata finds started occurring at the Adriatic sites at the end of the 1st century AD, mostly belonging to A production of sigillata that was made in northern Tunisia until the mid-3rd century AD when its production ceased. Its place was taken by A/D production in the 3rd and 4th centuries AD, and to a certain degree C production from the central Tunisia region. In the 4th and 5th centuries AD sigillata finds of D production from north Tunisia are most common.

Discussion

The overall picture of investigated underwater sites in the Croatian Adriatic at which artefacts of African provenance have been found is one of a generally high prevalence of this material.² The presence of African material in the Adriatic is evident across the majority of the maritime routes most frequently plied in the antique period. It also appears at less frequented places, which we cannot associate with direct routes between the north of Africa and the Adriatic, but rather with local transport

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² This paper is based on the author's doctoral dissertation titled 'African import recovered from the Croatian seabed dating from the 1st to the 5th century' (Pešić 2019).

routes between the various Adriatic hubs. It is evident that the distribution, but to an even greater degree the prevalence of this material, changed during the 1st century AD to 5th century AD period, and that there are periods from which finds of African origin in the Adriatic constitute only a fraction of the overall ceramic repertoire, while from other periods this material is almost ubiquitous.

Finds of the early, pre-mid-1st century AD, products of the African provinces are very rare in the Adriatic and appear only sporadically in the context of shipwrecks. The oldest among these finds is an amphorae of the Van der Werff 2/Maña C type from the Čavlin wreck site near Murter (10)³, of 1st century BC (Zubčić and Bekić 2003: 76; Jurišić 2004: 100). This find, however, cannot serve as proof of commercial links between Africa and the Adriatic. It can only be interpreted as a small part of a ship's inventory that indirectly demonstrates contacts between these two regions. Notable in the same context is the find of two Egyptian biconical amphorae and one Tripolitanian II amphora at a wreck site off the Plavac cape on Zlarin island (79); again not part of the ship's cargo, but testifying to the development of further indirect contacts between the Adriatic and Africa in the first half of the 1st century AD (Jurišić 2000: 24).

Based on the bulk of the cargo of these two wrecks - of which the first carried Lamboglia 2 amphorae from the western shores of the Adriatic, while the second likely sailed along the eastern Mediterranean ports from the Naples area with a cargo of Dressel 2-4 amphorae - we cannot speak of direct routes of African imports to the Adriatic, given that in the period prior to the mid-1st century AD these imports did not exist in any significant measure (Brusić 2001; Jurišić 2004). We can draw a similar conclusion with regard to individual finds of late 1st century AD and early 2nd century AD. African sigillata and cooking ware from the wreck off the Glavat cape on Mljet island (20). Along with a diverse cargo of Campanian and Pompeian pottery this ship also carried a variety of minerals, and raw glass and lead; some of the finds do, however, leave open speculation as to possible other purposes this cargo was intended for (Radić and Jurišić 1993; Radić Rossi and Borzić 2022).

The individual finds of African cooking ware at the Glavat wreck site were likely the crew's items of use, but the find of a singular luxurious jug does hint at the possibility that objects of this kind might have been intended for further trade. What these rare instances of material evidence of African ceramic material show is that on ships sailing in the period from the 1st century AD to mid-2nd century AD they are isolated items of the inventory used by the crew, which leads us to the conclusion that there was no significant level of organised import at the time. With regard to the recovered amphorae this is by no means a surprise; significant quantities are not to be expected in the earlier period if we bear in mind that the production of classical forms (with the exception of the Tripolitanian I form) that will be exported across the Mediterranean from the territory of Africa Proconsularis only began late in the 2nd century AD.

³ The number accompanying the name of the site corresponds to the position of the site on Figure 1.



Figure 1. Map of the sites with north African import in Croatian Adriatic (Elaboration by the Author).

And while finds from wreck sites do not point to frequent African imports, we do have somewhat more concrete archaeological evidence from the late 1st century AD to mid-2nd century AD period in the finds of cooking ware and sigillata ware, and in individual specimens of amphorae from the contexts of the few investigated Adriatic ports. The quantities in question may indicate that this period also saw organised importing activity, but that material evidence in the form of the cargoes of merchantmen carrying imports have yet to be found. The port of antique period Aenona, situated on the Kremenjača cape near Zaton (45), where numerous specimens of late 1st century AD to mid-2nd century AD sigillata and cooking ware of the Hayes 3A, 8A, 9A, 134, and Pallarés 14A forms have been identified, provides us with critical data concerning early African imports (Brusić 2006; Gluščević 1989; 2002; 2012).

Besides these, the antique period port near Zaton has also yielded a number of singular finds of early African amphorae of the Tripolitanian I, Dressel 2-4, and Pseudo Dressel 2-4 forms, while the Leptiminius II form may also be attributable to this period, as further corroboration of early ties with the African provinces. Early forms of African sigillata have been recovered in the Liburnia area in the course of the investigation of the Janice port (29) (Hayes forms 6B, 8A, and 9A) (Brusić 1977: 56; Parica 2018: 219), and the Mala Stinica (antique period Ortopla, (57)) site (Hayes form 9A) (Miholjek and Stojević 2012: 160–1), while there is presently only a single sherd from the first half of the 2nd century AD recovered at the Barbir port (3) (Hayes form 8A). To the finds of sigillata ware of early production, both at marine and land sites, we can join the finds of cooking ware which we posit reached some areas even before the sigillata forms did.⁴ This ware has also not been identified among the cargoes of Adriatic wrecks, but it is frequent between finds from some ancient ports.

The end of the 2nd century AD was notable for the rise to power of the Severan dynasty and the introduction of regular state-supervised olive oil distribution; this period also saw the continued growth of African imports across the whole of the Mediterranean (Hobson 2012: 204; Bonifay 2014: 153–4). With the production and export of wheat, olive oil, and fish products as the core drivers of the African economy came the attendant development of new ceramic production hubs in the area of central Tunisia, also known as C production, which in the coming period would see distribution to a broad market (Bonifay 2007a: 25; Atlante I: 58). We also see this trend of increased distribution both of ceramic products in general and amphorae in particular in the Adriatic sphere. Africana I olive oil amphorae and Africana IIA fish product amphorae appear to a lesser extent as individual finds, however their distribution only signals the areas into which African products would later spread. We find these forms of African amphorae at the Savudrija port (97), of late 2nd century AD. date, indicating that the transport of these products had reached the northern Adriatic shores, and certainly also further on to the antique period hubs on the Italian coast (Šalov 2014: 367; Koncani Uhač and Auriemma 2016: 157). Wrecks of ships carrying amphorae of this period as their primary cargo, however, remain very rare, and we can only place one un-investigated wreck in the waters around the Oruda islet with Tripolitanian II and III form amphorae in the 2nd century AD to 3rd century AD period.

⁴ Loron (Dubois 2001: Fig. 48); Narona (Topić 2004: T. 44. 196, 197, 199); Burnum (Borzić 2010: 411–3).

We continue to see imports of sigillata and cooking ware at the mentioned Adriatic ports up to the early/mid-3rd century AD. The most prevalent finds are of the Hayes 14 form, which we find at the ports at Zaton and Bošana (6). Also seen among the ceramic repertoire are representative specimens with relief appliqué such as the find of a Hayes 36 form vessel recovered at Bošana. The second half of the 3rd century AD is the period during which some of these ports, like Zaton or Janice, ceased to operate while, on the other hand, ports such as Polača (83) and Vis (129) continued to operate, and we see the emergence of new hubs of activity, such as the imperial villa at the Verige cove (128), which operated through to the late antique period. In the first half of the 3rd century AD we see a greater presence, along with A and C sigillata ware production, of A/D production (the Hayes 17B, Hayes 27, and Hayes 32 forms) at these ports. As these forms were manufactured at multiple locations in the Africa Proconsularis and Tripolitania provinces, we can conclude that there was further development of commercial ties with various parts of Africa, as is evident from the increased prevalence and diversity of amphorae types that found their way to the Adriatic. North African sigillata A/D production is not uniformly distributed across the whole of the Mediterranean, but does appear frequently at some of the Adriatic sites, and there is a possibility that there had been one direct line through which this pottery was transported from the African provinces, via Greece, to the Adriatic. Significant quantities of this production have been found, besides at Rome, in the areas of multiple land sites connected to the Adriatic; Brinidis, Butrint, Trieste, and Aquileia, and at some Greek cities such as Argos, Corinth, and Athens (Bonifay 2014: 155).

Imports of African amphorae into the Adriatic intensified after the mid-3rd century AD, and their distribution can be associated with the main maritime trade routes running from the south to the northern Adriatic. This pertains primarily to Africana II (late A, B-D) amphorae, and various variants of the Africana IIIA form which we find in the contexts of ports, and at wreck and anchorage sites. Their distribution follows the coastal route in the south of the Adriatic via Pelješac, and we also find them at the north end of Mljet, with isolated finds in central Dalmatia and, after somewhat more frequent appearances in the area of the Pašman channel and the broader Zadar region, we see that the route splits into two directions; one towards Pula and further northwards, and the other through the north end of the Velebit channel towards Rijeka. The picture of the pottery finds dated to the second half of the 3rd century AD is interesting insofar as this is the time when A production gradually peters out and disappears from the market, no longer (with the exception of isolated specimens of the Hayes 15 form) appearing even in the Adriatic. In this period the other production, C production in particular, had yet to see its full affirmation, and is found rarely in the Adriatic in a second half of the 3rd century AD context, such that the mid-3rd century AD is a period in which the finds indicate a rapid decline in imports of African sigillata ware to the Adriatic. The increased presence of C production from central Tunisia, most likely exported here and elsewhere via the port at Hadrumetum (Carandini and Sagui 1981: 58) is seen primarily in finds of the Hayes 50 form. If we compare the Adriatic with other parts of the Mediterranean, in particular the area via which these goods were transported towards the Adriatic, we see that the period around the mid-3rd c. is also elsewhere typified by the same phenomenon of a rapid decline in the presence of African pottery; we see this picture, for example, in Sicily, the eastern

Mediterranean, and in the territory of the African provinces (Bes and Poblome 2009: 76, 84; Fentress and Perkins 1988: 208; Fenteress *et al.* 2004: 148).

The 4th century AD period constitutes the zenith of African imports to the Adriatic, which is evident not only from the diverse forms of ceramic ware, but also from the great number of amphorae that are recorded in quantities not seen in earlier periods. This is the period that saw flourishing sigillata C and D production, and of the production of the most prevalent African amphorae, of the Africana IIIA and IIIB forms which, along with the Africana IIC form, we find across many of the Adriatic sites. We can follow the trans-Adriatic route by mapping out the many discovered shipwreck sites; these are the underwater sites at which we most often find 4th century AD African artefacts, testifying to vibrant maritime traffic in this period. Starting from find sites in the deep south like the Pličina Velika shallows near Cavtat (120) and the Dingački Školj islet off Pelješac (12), then following the many wrecks off the islands of Mljet (Pusti (90), Priježba (88), Vrh Kobrave (134), Pod Kula (82), Vela Dolina (118), Omanska luka (69)), and Hvar (Duboka (14), Petrov bok(77)), and further on to those in the Šibenik area (Kaprije (35), Sridan (103)), and the Zadar channel (Veli Školj (127), Babuljaš (2)), the maritime route then forks north of Zadar into two lines. Wreck sites have been identified on the branch of the route running through the Velebit channel (Santiš (95), Veliko Lukovišće (126), Povile (86)), and the branch leading to Pula (Veliki Brušnjak (118), Zanavin (138), Ploče (80), Zapadni greben (139)) and further along the shores of the Istrian peninsula (Uljeva B (116), Valmiževa (117), Sveti Ivan near Rovinj (108)).

Archaeological investigative work at the various wreck sites has provided us with invaluable data concerning the sizes of cargoes, the types and content of amphorae, the models and routes of transport, the other commercial goods carried by these ships, and about the ship's fittings and the items that belonged to the crew, which help us understand everyday life at sea. At all of these wreck sites the bulk of the cargo consisted of Africana IIIA and IIIB amphorae, with examples of the various variants of the Africana II form appearing in significantly lesser numbers. The production of both forms was dispersed among many locations across the eastern shores of present-day Tunisia, and we can say confidently that exports from this area constituted the preponderance of African material shipped to the Adriatic.

And while the amphorae of African origin are at some sites accompanied by individual or moderate numbers of amphorae originating from other regions, the logical assumption is that most of these ships were in fact associated with direct maritime routes between Africa and the Adriatic hubs. This can be inferred from the finds of relatively homogeneous cargoes of African pottery, such as seen, for example, at the wreck sites of Pličina Velika, Santiš and Babuljaš. As this was a period of vibrant commerce and traffic there are practically no wrecks at which we find only one form of amphora; usually they also include other amphorae of a secondary cargo. From our interpretation of finds that constituted a ship's cargo, and by distinguishing a ship's cargo from its inventory, we do see that some exhibit a degree of uniformity, which bears witness to organised transport between these two regions. The wreck at the Pličina Velika shallows, for example, could be attributed to one such direct voyage; while a number of amphorae of Aegean origin have been identified at this site, the 650 documented African amphorae at the site's surface level lead me to conclude that the ship's point of departure was in fact somewhere in

present day Tunisia, and that the LR2 amphorae constitute only a small part of a secondary cargo that was loaded during a stopover in the Aegean enroute to the Adriatic (Frka and Mesić 2012: 366; Mihajlović and Jurišić 2010: 104). When analysing wrecks, we should not disregard the fact that truly unique examples of large ship's cargoes have been identified in Croatia, which bear witness to the importance of the Adriatic route in the 4th c. Among the largest is the wreck at the Pličina Velika site, estimated to have had a cargo-carrying capacity of some 1200 amphorae and a length of about thirty metres.



Figure 2. Africana III amphorae at the shipwreck Pličina Velika shallows near Cavtat (Photo by the Author).

Estimates put the Pusti cape wreck (90) at a length of twenty to twenty-five metres and a capacity of some 1000 amphorae, the Petrov bok cove wreck (77) at twenty-five metres and a capacity in excess of 500 amphorae, i.e., from 50 to 100 tonnes, and the Duboka cove wreck at about twenty metres long and some 50 tonnes capacity, able to take on about 600 amphorae (Kisić 1987: 13; Petrić 1999b: 62–3, 65; Jurišić 2006a: 121; Jurišić 2006b: 153; Frka and Mesić 2012: 366). To understand the sizes of these wrecked Adriatic ships we can compare them with other 4th century AD wrecks in the broader Mediterranean. Notable among the larger ships is the Pointe de la Luque B wreck with a primary cargo of Africana IIIA and IIIB amphorae, having a length of about twenty metres and an estimated capacity of 50 to 65 tonnes (Liou 1973: 579–85; Nantet 2016: 487). The Isis wreck (Skerki Banks) near Sicily measured eighteen to twenty metres and had an estimated capacity of 60 tonnes (McCann 1994: 49). The Heliopolis 1 wreck in

France was fourteen metres long, with a 32 tonne capacity and a cargo of about 720 *Africana IIIA* and *IIIB* amphorae (Joncheray 1997: 164; Nantet 2016: 480). There is also a wreck off the Makronissos island with a cargo largely consisting of African amphorae, of which some 350 have been identified in just the surface layer (Koutsouflakis and Argiri 2015: 9). If we compare these examples from the broader Mediterranean area with wrecks identified in the Adriatic, we can only conclude that some of the Adriatic wrecks are among the largest ships dated to the 4th century AD.

At some 4th century AD and early 5th century AD wreck sites the amphorae are accompanied by finds of *sigillata* and cooking ware, which presents us with interesting evidence of the various materials shipped out of African territories. At most wreck sites the presence of these wares is small in number, and they are consequently identified as a secondary cargo or, in some cases, as part of the ship's inventory. Examples of wreck sites at which finds of *sigillata* ware are identified as part of the ship's inventory are the Veli Školj and cape Uljeva B sites, where these individual specimens are not attributed as goods for further distribution since the bulk of the cargo consisted of Aegean cooking ware. Archaeological excavation has not yet been performed at wreck sites like Sveti Ivan near Rovinj and Zanavin (138), and the specific purpose of the identified *sigillata* ware remains thus unresolved. Two *sigillata* ware plates recovered at the Pusti cape wreck site were, as particularly noteworthy, identified as objects intended for further sale (Kisić 1987: 29–30), which characterises them as part of the ship's secondary cargo, notwithstanding that the small quantity does not impart this impression.

The only Adriatic wreck sites at which African *sigillata* ware is present in greater quantity are those off the Babuljaš islet and in the Duboka cove, with both the quantity and particular characteristics of the individual specimens strongly supporting the hypothesis that they constituted part of a cargo intended for further distribution. The greater prevalence of *sigillata* ware at 4th century AD wreck sites is not typical of earlier periods in the Adriatic and likely speaks to shifts in the economy and the trade routes. We see here products of central and northern Tunisia together with diverse forms of amphorae which, on most of these ships, constituted the primary cargo. These include for the most part the Hayes 50 forms of C (the Babuljaš, Zanavin, and Duboka sites), and C/E (the Babuljaš site) production, followed by typical examples of C production of the Hayes 52B (Duboka and Veli Školj), and Hayes 53A forms (Babuljaš and Duboka), and D production forms Hayes 53B (Sveti Ivan near Rovinja), Hayes 58B (Duboka and Zanavin), Hayes 59 (Duboka, Veli Školj, and Kamenjak (32)), and Hayes 61 (the Pusti, Duboka, and Kamenjak sites). Some of these forms were in use beyond the 4th century AD and, based on other finds recovered at some of the wreck sites, can also be dated to the early 5th century AD period (e.g., Hayes 59 and 61 at the Veli Školj and Kamenjak wreck sites, and Hayes 67 at the Veliki Piruzi site (125)).

Although it is not identified at most sites as part of a ship's cargo, and no hard conclusions can consequently easily be inferred as to the model of export that would have been applied to the transport of *sigillata* ware, it is evident that market demand saw these goods reach end consumers during the period of the most intensive export of African material to the Adriatic. Based on the loci of *sigillata* ware production, and the accessibility of harbours from whence it could have been exported, we can confidently assume that Carthage, even Neopolis, were the primary trade ports for D production, while

some of the central Tunisian ports like Hadrumetum, Leptiminus, and, in particular, Sellucthum served C and C/E production. We find evidence of similar pottery forms at many port complexes in the Adriatic, and the typological picture of the recorded forms does not deviate from the typical phenomena of that period. Hayes 50 is the most prevalent of the C and D production forms (the Barbir, Kožino (74), Vis, Polače, Novigrad (107), Vižula (130), Verige, and Žunac (142) sites), while the Hayes 61 form is the most frequent import attributed to D production (recovered at the port sites of Zaton, Barbir, Kožino, Polače, Verige, and Žunac). These two forms are present—with greater prevalence than at underwater sites—at many on-land coastal sites, and their abundance testifies to the intense influence of African forms across the whole of the Adriatic sphere (Dvoržak-Schrunk 1989: 67–8, 78–9; Pröttel 1996: 269–70, 277–8; Vidrih Perko and Pavletić 2000: 264; Mardešić and Šalov 2002: 123–4).

At Adriatic sites cooking ware also appears in diverse contexts, for the most part related to ports, and to a lesser extent with wreck sites. These are chiefly shallow and deep casserole forms (the Hayes 23 and Hayes 197, and to a much lesser extent the Hayes 183/184 forms), shallow pan forms (Hayes 181), and the attendant lids (Hayes 185, 195, 196). Their production and use is dated to the broad period from the 2nd century AD through to the 5th century AD, i.e., up to the end of the period during which the typical forms of African cooking pottery appear; production and export of ware in a similar tradition continued beyond this date, but we have no confirmed finds from the later periods in Croatian waters.

The broad dating range associated with most of these forms means that finds in port contexts cannot at times be placed within a narrow chronological frame, however their presence certainly testifies to unbroken commercial relations with Africa over an extended period of time. At these wreck sites we find cooking ware forms associated for the most part with the function of items of use that served the ship's crew, rarely are they identified as being part of the cargo, and their dating is usually based on the chronological frame established by other finds in these contexts.⁵

Apart from the isolated example of cooking ware found at the Glavat wreck site and dated to the late 1st century AD and early 2nd century AD, we do see that, in the context of ships, they are largely attributable to the 4th century AD (Duboka, Pusti), the transition from the 4th century AD to the 5th century AD (Babuljaš, Veli Školj), and the 5th century AD (Veliki Piruzi, Zaklopita (137)). And while at most sites they are recorded as individual finds only, given the find of a greater number of identical forms, it is possible that cooking ware did in fact constitute a small part of a secondary cargo of the ships wrecked at the Babuljaš and Zaklopita cove sites. The investigative work at the Babuljaš wreck identified over twenty incomplete vessels and a somewhat greater number of lids, which is the largest assemblage of cooking ware at any one Adriatic wreck site.

⁵ At most Mediterranean wreck sites cooking ware is also attributed to items of use, with only a few sites at which it is attributed to the cargo (Pontacolone and Incitti 1991; McCann 2001; Medaglia and Rossi 2010).

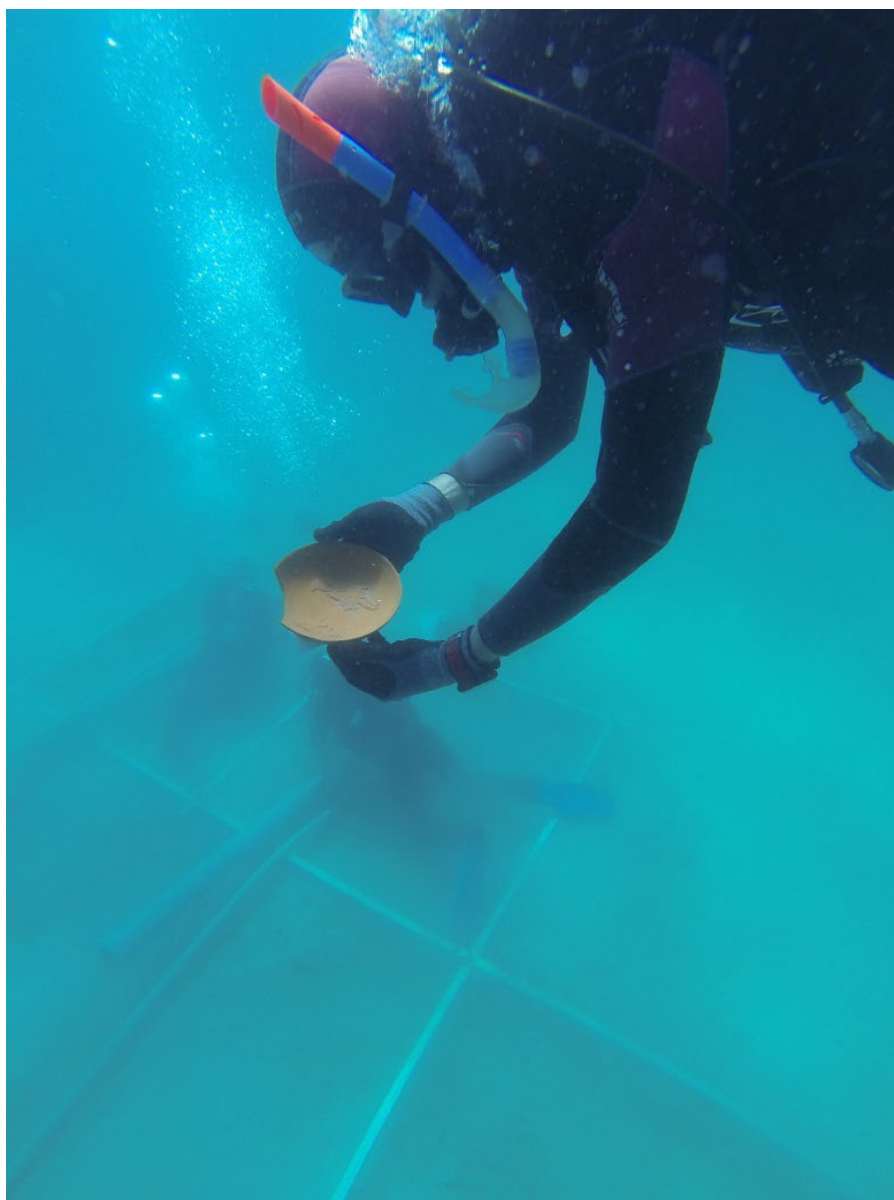


Figure 3. Discovery of the Hayes 53 plate from Babuljaš shipwreck (Photo by L. Bekić).

With the first half of the 5th century AD came the gradual decline of African production, represented in the Adriatic with an ever-diminishing number of underwater finds. At some wrecks from this period, we see for the most part finds of Spatheion 1 amphorae, with the odd large dimension amphora, such as Keay's form XXXV (Zaklopita, Veliki Maslinovac (124), Veliki Piruzi, Škardski rt (111), and Kamenjak). The sizes of the ships of this period and of their cargoes is indicative of a decline in the quantity of imports, as these were largely transports of smaller cargoes of amphorae. At some wreck sites we continue to find D production pottery, notable among which are the Hayes forms 59, 61, and 67 as a continuation of the 4th century AD trend of the presence of other ceramic ware alongside amphorae. The port complexes and the landings serving Roman period coastal villas show a drastic drop in the

numbers of African amphorae, while sigillata ware continues to be represented at port complexes. Among the amphorae we see variants of the Spatheion 1 form (Savudrija), while among the other pottery forms the bulk is comprised of individual finds of D production ware, recovered at the port sites at Barbir, Novalja, Polače, the Žunac cove, Vis, Vižula, and Verige (the above-mentioned Hayes forms 59, 61, and 67).

The Vandal conquests of the African territories did not bring the production of amphorae and other ceramic ware to a complete halt, but the vibrant maritime import traffic which the abundance of finds indicates was an almost daily affair in the 4th century AD became intermittent by the mid-5th century AD, with underwater sites in the Adriatic indicating that these imports were almost absent beyond that time. Consequently, with the exception of a few sites (Dobrinka (13), Lokrum (51), Tradanj (114)) and what are likely some earlier variants at the Veliki Piruzi wreck site, we do not see any particular abundance of finds of Keay's LXI and LXII types, African forms that appear in the late 5th century AD and in the 6th century AD.⁶ Finds of sigillata ware of African provenance dated beyond the mid-5th c. are minimal in number, with individual finds recorded only at the ports at Polače (Hayes 67C), Verige (Hayes 80), Savudrija (Hayes 89), Vis, and at the Žunac cove (Hayes 91). The evidence of maritime shipping of amphorae to the Adriatic from the period between the Vandal conquest of the African provinces and during their primacy, and from the mid-6th century AD and beyond when Byzantium asserted its rule in the African territories, is sporadic at best. One of the few such examples is the site off the Lago cape on Lastovo island (48) where amphorae and other ceramic ware was recovered dating to the second half of the 7th century AD; this is the sole example of an Adriatic site of the wreck of a ship carrying a cargo of amphorae produced in Africa during the Byzantine period.

Conclusion

Based on our current understanding of the trade in amphorae and other ceramic ware from Africa we can conclude that there was no uniform model for the transport of this material to its final destination. As we have seen, there were various combinations of transport; homogenous ship's cargoes consisting only of African amphorae, at other times accompanied by material of a difference provenance, and sporadic examples of the combined transport of amphorae and other pottery from Africa. That there were direct lines between the north of Africa and the Adriatic hubs is evident from the numerous identified shipwrecks, but we cannot confidently assert to what extent these ships were sailing for a destination among the antique period ports on the eastern shores of the Adriatic, or were headed, rather, for destinations in the Italic territories. We can only draw on the quantity of archaeological finds recorded in and around the major hubs like Salona, Iader, and Pola, and the needs of their inhabitants, in drawing inferences as to whether some of these ship's cargoes were intended directly for these cities.

⁶ Finds of these forms are known of at on-land sites in Croatia, both on the mainland and the islands (Vidrih Perko and Pavletić 2000: 266; Čargo 2010: 112).

The large cargoes of amphorae identified at Adriatic sites like those at the Pličina Velika shallows, Pusti cape, and Duboka cove were likely destined for one of the major Adriatic cities, but we cannot rule out that they were intended for transport and distribution further inland. Enroute some of these ships spent at least some time stopping over at smaller settlements, as is borne out by the numerous finds recovered in the contexts of these minor ports across the Adriatic. Fluctuations in African find numbers across the Adriatic seabed within the overall frame of other imported products paints a picture of its exceptional significance, and is a valuable indicator of the vigorous and dynamic traffic between these two distant regions, starting from the late 1st century AD, peaking in the 4th c., and running through to the mid-5th century AD.

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Knidos Late Antique Period Amphorae: Contexts and Underwater Finds¹

Songül Sözel²

Abstract

Knidos, located at the southwestern tip of the region of Caria, has a rugged and challenging geography. However, due to its location on the ancient sea trade routes, it was able to accommodate a population of forty to sixty thousand. Serving as the administrative and commercial center of the entire Datça Peninsula, Knidos was a hub where the products of Datça were presented to foreign markets, and necessary resources were procured. Thanks to its strategic location, Knidos, which effectively managed maritime networks, focused on wine production, importation, and, consequently, the trade of amphorae, which formed the cornerstone of commerce.

This study aims to provide a fresh perspective on the changes in trade during that era in the light of the Late Antique period amphorae. The research will also include amphorae found in different parts of the city, especially those discovered underwater. By utilizing the amphorae from the 4th to the 7th centuries AD, an assessment will be presented, taking into account the overall condition of the city, social life, and economic circumstances during that period. This evaluation aims to shed light on Knidos' general situation, social life, and economic conditions during the mentioned period by considering the amphorae.

Introduction

Late Antique period amphorae found in Knidos, both on land and underwater, Africa Type II, Late Roman Amphora 1, 2, 3, and 4, Late Roman Amphora 8-M 273, Ephesos 56, Samos Cistern Type, and Spatheion types, have been analysed. A total of 20 samples were examined, including artifacts recovered from terrestrial structures and spaces, as well as those found during underwater excavations. In addition to

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the terrestrial structures, spaces, and contexts, which include Kap Krio and the mainland section that served a function during the Late Antique period, the study also takes into account the amphorae recovered from underwater excavations, such as the Knidos South Breakwater, Kap Krio and Aslanlı Burun underwater excavations, the excavations on the southern face of the Fener Breakwater, and the shipwreck discovered in that area.



Figure 1. Knidos Late Antiquity Period Amphora Finding Places.

When examining the locations of the samples, it is determined that the sample belonging to Africa Type II (Nr. 1-2), recovered from the Military Port East and Military Port Chapel, was obtained from the Knidos Kap Krio (Aslan *et al.* 2020: Cat. No. 7, Fig. 8) Underwater Research. The sample belonging to Late Roman 1A (Nr. 3), recovered from Dionysos Terrace West Space 3, was obtained from the Knidos Kap Krio (Aslan *et al.* 2020: Cat. No. 9, Fig. 10) Underwater Research. The sample belonging to Late Roman 1B (Nr. 4), recovered from Harbor Street Space 4 (Doksanaltı 2020: 415, Fig. 8, No. 48), has similarities to the samples obtained from Knidos Kap Krio (Aslan *et al.* 2020: Cat. No. 9, Fig. 10) and Knidos South Breakwater (Aslan 2015b: 112, Fig. 18) Underwater Research. The sample belonging to Late Roman 1C (Nr. 5), recovered from Space 2 in the Military Port East, has similarities to the samples obtained from Knidos South Breakwater (Aslan 2015b: 112, Fig. 19) Underwater Research.

The sample belonging to Late Roman 2A (Nr. 6), recovered from D Church South, was obtained. The sample belonging to Late Roman 2B (Nr. 7), recovered from II Terrace West Opening 1, has similarities to the sample obtained from the shipwreck on the southern face of Knidos Fener Breakwater (Aslan 2015b: 118, Fig. 30) in the underwater research. The sample belonging to Late Roman 2C (Nr. 8), recovered from Small Theater West Opening 14, was obtained from the shipwreck in the entrance

direction of Knidos South Breakwater (Aslan 2015b: 114, Fig. 24) and the underwater research on the South Breakwater (Aslan 2015b: 113, Fig. 20).

The samples belonging to Late Roman Amphora 3 (Nr. 9-10) were obtained from Space 4 in Harbor Street (Doksanaltı 2020: 416, Fig. 9, No. 60; Fig. 10, No. 67). The sample belonging to Late Roman 4 and type A2 (Nr. 11), recovered from Space 3 in Harbor Street, was obtained from the underwater research on Knidos South Breakwater (Aslan 2015b: 111, Fig. 14). The sample belonging to Late Roman Amphora 4 and type B1 (Nr. 12), recovered from Small Theater West Opening 8, was obtained from the underwater research on Knidos South Breakwater (Aslan 2015b: 111, Fig. 15). The samples belonging to Late Roman Amphora 4 and type B2 (Nr. 13-14), recovered from Small Theater West Opening 10 and Tholos Structure, were obtained.

The sample belonging to Late Roman Amphora 8 (Nr. 15), recovered from D Church South and II Terrace West Space 3, was obtained. The samples belonging to Ephesos 56 (Nr. 16-17), recovered from D Church South and II Terrace West Space 3. The sample belonging to Samos Cistern Type (Nr. 18), recovered from Dionysos Terrace West Space 3, was obtained from the underwater research on Knidos South Breakwater (Aslan 2015b: 113, Fig. 22). The samples belonging to Spatheion 3 Type 3C (Nr. 19-20) were obtained from Space 4 in Harbor Street (Doksanaltı 2020: 416, Figs. 10, 62).

The earliest Late Antique amphora discovered in Knidos, both underwater and on land, dates back to the first half of the 5th century AD, while the latest example is dated to the mid-7th century AD. When dating the Knidos amphoras, form characteristics and similarities have been taken into account, but the most significant factor has been the context of the findings. The evaluated samples have been examined and described from early types to late types and numbered from 1 to 20.

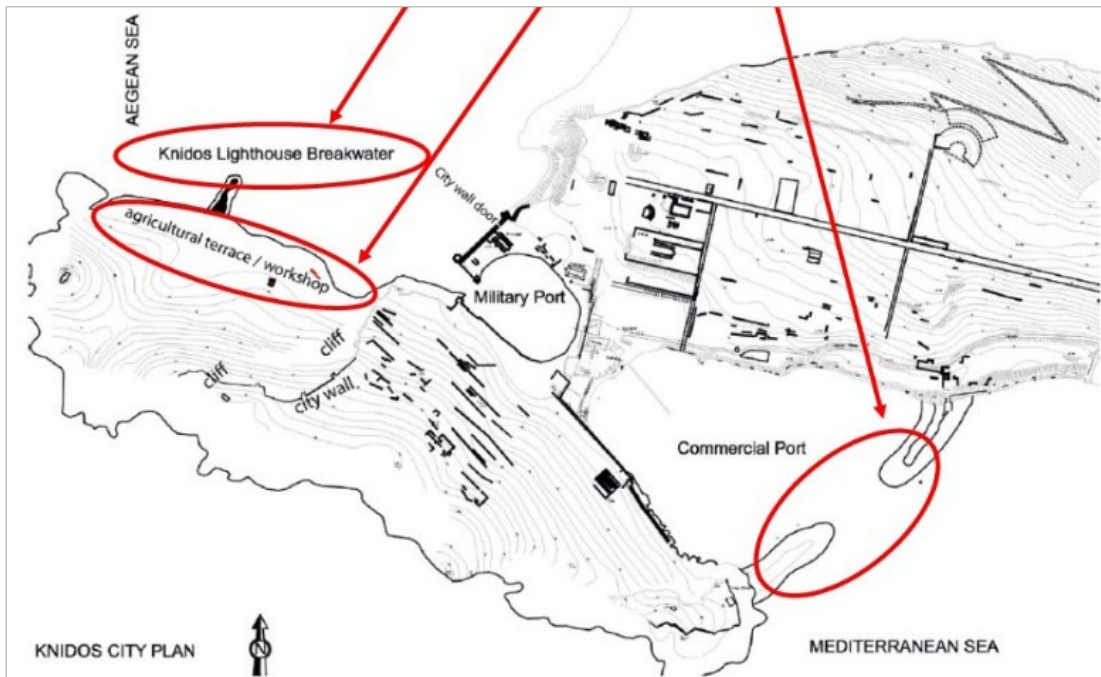


Figure 2. Knidos Late Antiquity Period Underwater Amphora Finding Places.

Nr.1-2 (Africa Type II) is an amphora originating from North Africa (Tunisia). It has a thick rounded lip, a break from the neck to the body, and vertical handles that start on the neck and likely end on the shoulder. There are grooves on the inner surface of the neck and below the lip on the outer surface. It is broken where the body widens. Similar examples of Africa Type II/C3 group can be found in Skhodra (Hoxha 2003: 141, Pl. IV/8, IX/14-15), Nabeul (Bonifay 2004: Fig. 61/23), Barcelona Museum (Manacorda 1977: Fig. 555), Sidi Aoun (Ramon 1986: Fig. 17, No. 3), and Parion (Akkaş 2020: Figs. 8, 21, 22). It is dated to the first half of the 5th century AD.

Nr.3 (LRA 1A) is a type of amphora commonly produced in the Mediterranean region and used in the trade of olive oil and wine (Tekocak and Zoroğlu 2013: 117). It has a thick, rounded lip with a distinct transition from the lip to the neck, and a profile that widens from the neck to the body. It has oval-shaped cross-sections starting from below the lip and ending on the neck, with grooves on the surface and opposing handles (Şenol 2003a: 82). Similar examples can be found in many centers in the Eastern Mediterranean (Reynolds 2015: 457), including Elaiussa Sebaste (Ferrazzoli and Ricci 2009: 37, Fig. 6; Ferrazzoli and Ricci 2010: 815-26), Kelenderis (Tekocak and Zoroğlu 2013: Fig. 12-27), Marseille (Bien 2005: 286, Fig. 3-3; Bonifay 1986: Fig. 7-20, 21; Bonifay and Pieri 1995: 108-109, Fig. 6-41; Bonifay and Villedieu 1989: Fig. 5-1), Durres (Shkodra 2006: 438, Figs. 6, 29), Korykos (Alkaç 2012: Fig. 11), Kourion (Hayes 2007: 454, Fig. 14.16, P2; Williams 2005: 159, Pl. 2, Fig. 2), Taşucu Museum (Şenol 2009: 228-9, No. 52-54), Marmaris Museum (Şenol 2003a: 85), Cyprus (Demesticha 2013: 173, Fig. 1), Beirut (Reynolds 2010: 107, Fig. 4, d. 89-114), Kekova (Aslan 2015a: 365, Fig. 2, 17), Paphos (Demesticha 2000: 549-54; Hayes 2003: Figs. 21a-223), Nicopolis (Reynolds and Pavlidis 2014: 459, Fig. 6, 5), Ravenna (Cirelli and Cannavici 2014: 970, Fig. 6, 1-2), Tarragona (Keay 1984: Type LIII A, Fig. 32, 7-8; Fig. 115, 3-5; Fig. 116; Fig. 117, 1-4), Yassı Ada (Bass and Van-Doorninck 1971: Figs. 10-11), Alexandria (Şenol 2001: 375-81; Şenol 2003a: 202-3), Soli/Pompeiiopolis (Autret *et al.* 2010: 204, Figs. 2, 6), Ephesus (Bezczeky 2005: 205-6, Pl. 3; Bezczeky 2013: Pl. 33, No. 370), Klazomenai (Gürbüzer 2018: Fig. 15/59-60), Smyrna (Şenol 2015: 249), Rhodes and İçmeler (Empereur and Picon 1998: 239, Fig. 18). It is dated to the mid-5th century AD.

Nr.4 (LRA 1B) amphorae are characterised by their narrow mouth diameter, thick and rounded lip profile. Similar examples can be found in Kelenderis (Tekocak and Zoroğlu 2013: Figs. 28-34), Anemurium (Williams 1989: 95, No. 562, Fig. 56), Elaiussa Sebaste (Ferrazzoli and Ricci 2007: 677, Fig. 2a), Durres (Shkodra 2006: 438, Fig. 6, 30-31), Ravenna (Cirelli and Cannavici 2014: 970, Fig. 6, 4), Alexandria (Şenol 2003b: 470, No. 4; Şenol 2007: 67, Fig. 1), Korykos (Alkaç 2012: 331, Figs. 4-13), Berenike (Riley 1979: Figs. 91/346, 347), Nicopolis (Reynolds and Pavlidis 2014: 459, Figs. 6,4,7), Taşucu Museum (Şenol 2009: 233-6, No. 59-63), Zeugma (Reynolds 2013: Fig. 12; Pl. 73, AM463, AM465), Klazomenai (Gürbüzer 2018: Fig. 15/61), Marmaris Museum (Şenol 2003a: 85-6, No. 29), Butrint (Reynolds 2019: Figs. 5.6/33, 5.7/23), Athens Agora (Robinson 1959: Pl. 32, M333), Cyprus (Demesticha 2013: 176, Fig. 3), Pompeiiopolis (Opait 2018: Fig. 27, 30), Mersin Museum (Şenol and Kerem 2000: 94, No. 17), Anamur (Zoroğlu *et al.* 2009: 39, Res. 6. 43-50), Mersin (Şenol and Kerem 2000: 93), Kelenderis (Tekocak and Zoroğlu 2013: 122), Crypta Balbi (Sagui 1998: Fig. 9-2), Marseille (Bonifay and Pieri 1995: 108, Fig. 6 No. 44; Pieri 2005: 74-5 Pl. 16; No. 1, 5, Pl. 17 No. 2), Carthage (Fulford and Peacock 1984: Fig. 34-1, 2), Kourion (Riley 1982: 116), Silifke (Alkaç 2013: 114, Fig. 9), Kekova (Aslan 2015a: 365, Figs. 2, 18), and Soli/Pompeiiopolis (Autret *et al.* 2010:

206, Figs. 7-8). The form characteristic, similarities, and context suggest that Nr. 4 (van Alfen 1996: 197, Type V, Figs. 7- 8; Doksanaltı 2020: 394, Fig. 8, 48-51; Opait 2004: 9-10, LRA 1D; Pieri 1998: 99, Fig. 2, LRA 1B1; Reynolds and Pavlidis 2014: 452, Fig. 6.2-6) should be dated to the early 7th century AD.

Nr.5 (LRA 1C) is characterised by a more pronounced and pointed band-like projection on the neck compared to LRA 1A and LRA 1B examples. Similar examples can be found in Silifke (Alkaç 2013: 115, Fig. 10), Taşucu (Şenol 2009: 244-7), Kekova (Aslan 2015a: 365, Fig. 2,19), Cyprus (Demesticha 2013: 177, Fig. 4), Kos (Poulou-Papadimitriou and Didioumi 2010: 748, Fig. 7) and Nicopolis (Reynolds and Pavlidis 2014: 459, Fig. 6,3), as well as Elaiussa Sebaste (Ferrazzoli and Ricci 2007: 677 Fig. 2.a). It is dated to the first half of the 7th century AD.

Nr.6 (LRA 2A) is considered the continuation and successor of the Late Roman 2 amphorae known as Dressel 24, which were prevalent in the Eastern Mediterranean between the 4th and 7th centuries AD (Akkaş 2020: 197). It features a rounded and thick lip transitioning to a cylindrical-conical neck, with a distinct transition from the neck to the body. It has oval-shaped vertical handles starting below the lip and ending on the shoulder. Similar examples can be found in Beirut (Pieri 2005: 85-93, Fig. 45), Gaul (Pieri 1998: 100), Nicopolis (Reynolds and Pavlidis 2014: 461, Fig. 8,3), Athens Agora (Robinson 1959: 109, M272), Carthage (Peacock and Williams 1986: 184), Berenike (Riley 1979: 217), Kekova (Aslan 2015a: 365, Fig. 2, 20), Tomis and Marmaris Museum (Şenol 2003a: 97), Paphos in Cyprus (Şenol 2009: 250). It is dated to the mid-6th century AD.

Nr.7 (LRA 2B) is a short-necked amphora with an outward-opening funnel or cup-shaped mouth. It has a long and conical neck that widens towards the body and tapers from the shoulder to the base in an ovoid form. It has oval-shaped vertical handles starting below the lip and ending on the shoulder. The shoulder is particularly ribbed, especially on the body. Similar examples can be found in Marseille (Pieri 2005: 266, Pl. 26), Stobi (Anderson-Stojanovic 1992: 96, Pl. 82, No. 700-701), Torre de Audiencia and Villa Romana (Keay 1984: 354, Fig. 165), Topraichioi (Opait 1991: 212, Cat. No. 11-12, Fig. 14, No. 1-2), Durres (Shkodra 2006: 438, Figs. 6, 32-35), Constantinople (Kara 2021: 76, Fig. 1a), Kekova (Aslan 2015a: 365, Fig. 2,2), Alexandria (Konstantinidou 2010: 951, Fig. 5, No. 13), Miletus (Berndt 2003: 60, 242, Pl. 79, A362), Nicopolis (Reynolds and Pavlidis 2014: 461, Fig. 8,1), and Butrint (Reynolds 2019: Figs. 4.3/5, 5.12/2, 6.1/2). Based on its form and similarities, especially considering the archaeological context, Nr.7 (Bass and van Doornick 1982: 157-60, CA13-CA21, Fig. 8 4-6; Opait 2004: 126, Pl. 6.7) is dated to the first half of the 7th century AD.

Nr.8 (LRA 2C) has a slanted rounded mouth and a long neck. The long neck has internal ribs and starts with an oval section, possibly ending on the shoulder with handles. Similar examples can be found in Parion (Akkaş 2020: 198, Cat. No. 36, Fig. 11), Kekova (Aslan 2015a: 365, Fig. 2, 22), Taşucu Museum (Şenol 2009: 248), Yassiada Shipwreck (Bass and van Doornick 1971: 27), and Constantinople (Kara 2021: 77, Fig. 2a). It is dated to the first half of the 7th century AD.

Nr.9-10 (LRA 3) amphorae, believed (Aslan 2015a: 339) to have been produced in different regions of Western Anatolia, specifically Ephesus, Samos, Kos, Sardis, and Halicarnassus, were used (Bezeczky 2013:

23, 163, 166; Pieri 2005: 94-101) for the import of olive oil, ointment, wine, and garum sauce (Pieri 2005: 100; Şenol 2009: 153). The early phases of LRA 3 forms date from the 1st century AD to the 4th century AD, while the later phases were produced from the 4th century AD until the end of the 7th century AD for export (Pieri 2005: Fig. 60-61). Similar examples can be found in Antandros (Aktaş 2018: Cat. No. 637, 643-644), Marseille (Pieri 2005: 270, Pl. 30), Aegyso (Stănescu 2018: Fig. 10/1), and Parion (Aktaş 2020: Cat. No. 41). They can be dated from the late 6th century AD to the early 7th century AD.



Figure 3. Knidos Late Antiquity Period Amphorae, Nr. 1-9.

Nr.11 (LRA 4A-A2) is one of the common forms of Late Roman 4 amphorae, also known as 'Gazze' jars, classified (Riley 1979: 331-59). It is understood that the production of LRA 4 forms took place in

workshops in the Levant region (Peacock and Williams 1986: 196-9; Riley 1975: 27-31). They are commonly found in archaeological layers dating from the 4th to 6th centuries AD in settlements (Peacock and Williams 1986: 198; Pieri 2005: 106-8; Riley 1979: 220; Şenol 2009: 158) in North Africa, Carthage, Gaul, Western Europe, the Southern Mediterranean, and the Western Black Sea regions (Peacock and Williams 1986: 198-199 (Class 49); Riley 1981: 110, 120 (Late Roman 4)). They have an upward-slanting rim, a shoulder with horizontal and deep grooves, and clay particles can be found on the shoulder. Similar examples can be found in Pompeiopolis (Opait 2018: Fig. 19), Kekova Underwater Research (Aslan 2015a: 365, Fig. 2, 25), Sinope Shipwreck F (Opait *et al.* 2019: Fig. 6a-b), Alexandria Greco-Roman Museum (Şenol 2018: Cat. No. 372-376), Bodrum Museum (Alpözen *et al.* 1995: No. 461), Mersin Museum (Şenol and Kerem 2000: 92), Silifke Museum (Alkaç 2013: 115), Marseille (Pieri 2005: No. 9,13,17,22,25,32,37,39), Durres (Shkodra 2006: 440, Fig. 7,42), Beirut (Aubert 1996: 79, Fig. 11), Butrint (Reynolds 2019: Fig. 3.12/10), and Tarragona (Keay 1984: Fig. 121/2-8). They are dated to the late 6th century AD and the first half of the 7th century AD.

Nr.12 (LRA 4B-B1) has a thick, rounded rim with a slightly outward slant and a short neck. Clay particles can be found around the shoulder. Similar examples of Knidos amphorae can be seen in Hispalis (Carredano *et al.* 2007: 135, 143, Fig. 3, No. 13), Tarragona (Keay 1984: Figs. 121-3), Saraçhane (Hayes 1992: 62, Fig. 22/5), Alexandria (Majcherek 1995: 173, Pl. 4), Ravenna (Cirelli and Cannavici 2014: 966, Fig. 2,4-7), Berenike (Riley 1979: Fig. 92, No. 351-3), Corinthos (Slane and Sanders 2005: 263, Fig. 5, No. 2.26), Sinope Shipwreck F (Opait *et al.* 2019: Fig. 7a-b), Silifke Museum (Alkaç 2013: Fig. 11), and Bodrum Museum (Alpözen *et al.* 1995: Env. No. 1.13.83). They are dated to the late 6th century AD and the first half of the 7th century AD.

Nr.13-14 (LRA 4B-B2) have a thick, rounded rim and a short neck. Compared to the other two types, this type has a narrower shoulder where clay particles are irregularly distributed. They have an oval-shaped cross-section and a single handle. Similar examples can be found in Yassı Ada I Shipwreck (Bass 1982: 184, Fig. 8-19/P73), Alexandria (Majcherek 1995: 175, Pl. 6/1-6), Alexandria Gabbari Necropolis (Şenol 2001: Fig. 10.8), Beirut (Aubert 1996: 79, Fig. 12), Ravenna (Cirelli and Cannavici 2014: 966, Fig. 2, 8-12), Topraichioi (Opait 1991: 234, Fig. 16/1-2), Pompeiopolis (Opait 2018: Fig. 20), Berenike (Fulford and Peacock 1984: Fig. 35/12-13; Riley 1981: 111, Fig. 8/11), Carthage (Riley 1979: Fig. 92/354), Tarragona (Keay 1984: 280-1), and Butrint (Reynolds 2019: Fig. 5.6/35). Knidos examples, based on their context, can be dated to the first half of the 7th century AD.

Nr.15 (LRA 8), also known as M 273 amphorae, can be found in many centers in the Aegean Islands and Western Anatolia. LRA 8 (M 273) amphorae have a slightly outward-slanting and band-shaped rim, a neck that can be grooved or ungrooved, a shoulder with grooved handles, an ovoid or sometimes bulging-grooved body, and a conical base (Şenol 2003a: 90-94). LRA 8 amphorae produced in the Maeander Valley and its surroundings are thought to bear similarities to LRA 3 and Ephesos 56 (Pieri 2005: 136). Nr. 15 has a thick, rounded rim that transitions to a deep hollow on the inner surface. Similar examples can be found in Yassı Ada Shipwreck (Bass and Van-Doorninck 1971: Pl. 2/8), Saraçhane (Hayes 1992: 62-3, 223, Fig. 22/2), Butrint (Reynolds 2004: 233-4, Fig. 13/199-201, 336b-e), Athens Agora

(Robinson 1959: 109, M 273, Pl.29, 58), Benghazi (Riley 1979: 234, Fig. 95. D390), Tomis (Opaiț 2004: 18, Pl. 12.2), Durres (Shkodra 2003: 79-82, Pls. 11/2-4, 11/6-7,9, 16/1-2,4-5,8, 18/6, 19/3-4, 20/2-3), Ephesos (Bezeczky 2013: 156-157, Pl. 48/619-620), Silifke (Alkaç 2013: 113-4, Fig. 8), Beirut (Reynolds 2010: 94-96), and Marseille (Bonifay *et al.* 1989: 663). They can be dated to the first half of the 7th century AD.

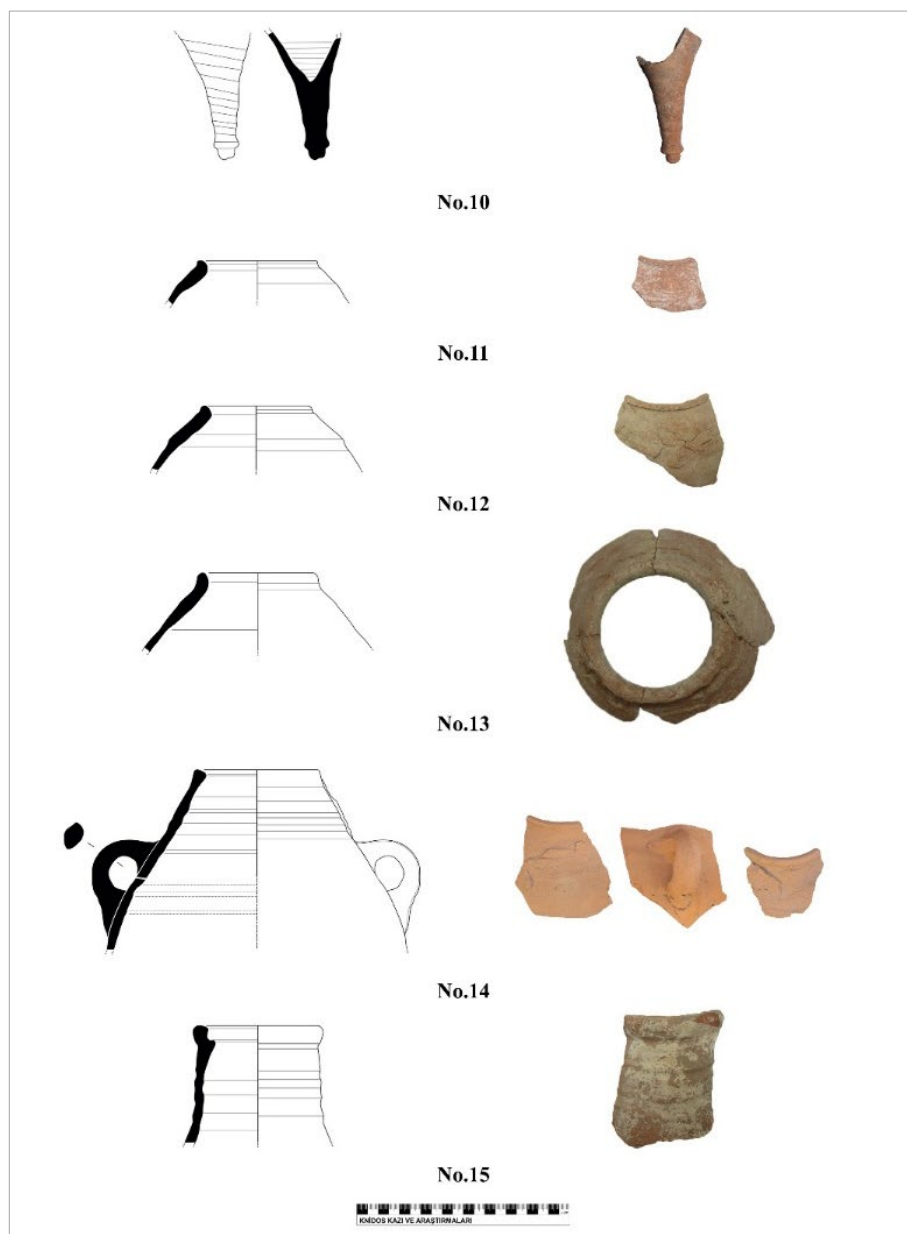


Figure 4. Knidos Late Antiquity Period Amphorae, Nr. 10-15.

Nr.16-17 (Ephesos 56), Ephesos Type 56 was first introduced by T. Bezecky (2005: 204). It was produced in Ephesos or nearby settlements between the late 4th century and the early 7th century AD (Bezeczky 2013: 26-31, 168). They have a slightly rounded or flat small rim, a short cylindrical neck, thin walls, angled handles that start below the rim and connect to the shoulder, and pointed solid bases. Similar

examples can be found in Ephesos (Bezeczky 2013: Cat. No. 389-398, 611-618, 861-871), Constantinople (Kara 2021: 78, Fig. 6), Carthage (Fulford and Peacock 1984: 123, No. 8-9), and Durres (Shkodra 2009: 311-324). They are dated to the early 7th century AD.

Nr.18 (Samos Cistern Type) amphorae, also known as Samos Cistern amphorae, take their name from the cistern structure on the island of Samos (Bonifay and Pieri 1995: 114). Generally, these amphorae have a slightly sloping flat rim, a short and wide cylindrical neck with grooves, short handles with grooves, and a cylindrical and elongated body. The body widens towards the base and can have deep grooves or a pointed or knob-like base. This is a widespread form found in the Aegean region, the Black Sea, Eastern and Western Mediterranean, and the Balkans (Bezeczky 2013: 157-8, n. 617). It shows a dense distribution in centers located in the Balkans and along the Danube River (Şenol 2009: 157). Nr. 18 has a rounded lip with a smooth transition to a broad form from the neck to the body. It has vertical handles with opposing oval sections. Similar examples can be found in Kekova (Aslan 2015a: 365, Fig. 2, 24), Anamur (Zoroğlu *et al.* 2009: 40) Taşucu Museum (Şenol 2009: 157), Içel Museum (Şenol and Kerem 2000: 99, No: 25) Durres (Shkodra 2006: 443, Fig. 9, 50-51), Butrint (Shkodra 2006: 444), Carthage (Riley 1981: 111, Fig. 8-11), and Rome (Manacorda 1995: 127, Fig. 5/1). They can be dated to the early 7th century AD.

Nr.19-20 (Spatheion 3-Type 3C) These amphorae (Grace 1961: Fig. 67), with their slender and elongated structures, were easily stacked in cargo ships (Şenol 2018: 236, Note 261). Spatheion Type 3C amphorae are considered part of the 'Miniature Spatheion' group based on their calculated capacities and body diameters (Bonifay 2004: 127, 'Spatheion' 3, Amphore Type 33, Fig. 69; Hayes 1992: 67, Type 14; Riley 1979: 226-7, LR Amphora 8a, Fig 92). The production of the C variant has been proven in the Zeugitana region of Neapolis. They are widespread in the Mediterranean and the Black Sea region (Bonifay 2004: 35, 39; Sagui 1998: 314). They can be found in Tunisia, Spain, southern France, Italy, Slovenia, Albania, Greece, Romania, Bulgaria, and Turkey (Istanbul, Yassı Ada shipwreck). Nr. 19 and 20 have a yellowish cream-colored clay fabric. Similar examples can be seen in Nabeul (Bonifay 2004: Fig. 69/6), Italy (Arthur 1989: 83, Figs. 2-3), Carthage (Peacock 1984: Fig. 42, No. 103), Constantinople (Kara 2021: 84, Şek. 18a-b), Kekova (Aslan 2015a: 365, Fig. 2, 35), Parion (Akkaş 2020: Fig. 21, 70-71), Içel Museum (Şenol and Kerem 2000, 86), and Taşucu Museum (Şenol 2009: 174). They can be dated to the mid-7th century AD.

Conclusion

This study discusses the forms of amphorae found both on land and underwater in the Late Period in the ancient city of Knidos, as well as the numerical density of these forms in different types. Among the amphorae recovered from Late Antique structures in Knidos and from underwater excavations, types belonging to Late Roman 1 and 2 are the most common. In addition to these types, amphorae belonging to Africa II, Spatheion, LRA 3, 4, and 8 have been identified in both land and underwater excavations.

Knidos amphorae were highly effective in maritime and overland trade in early periods. Similarly, through the findings indicating their intensive use in trade during the Late Antique period, it can be

concluded that amphorae continued to facilitate the transport of various goods, as they did in earlier periods (Doğer 2005: 45, 40). The presence of amphorae in many parts of the city and their extensive documentation in underwater wrecks suggest that maritime trade continued during the Late Antique period.



Figure 5. Knidos Late Antiquity Period Amphorae, Nr. 16-20.

In addition to their continuous usage throughout different periods, when examining the maritime and land findings of the Late Antique period, it can be concluded that commercial relations continued with Africa, the Eastern Mediterranean, and the Aegean regions. From the middle of the 7th century AD onwards, due to economic conditions and a decrease in the city's population, production only continued

as needed or came to a complete halt. The amphora findings from the 4th to 7th centuries AD demonstrate that social life became more vibrant in certain areas of the city and left traces of daily life in specific structures. Along with its structures that constitute the living area on the island and the mainland, it did not lose its value from its establishment until its abandonment but rather carried it forward.

Catalogue ³
Nr.1: Dimensions: H: 6.7 cm. AR: 8.6 cm. Clay: (5 R 7/6 light red). Slip: (2.5 YR 7/2 pale red). Paste: It is composed of lime, sand, and silver mica, with a firm texture and dense porosity.
Nr. 2: Dimensions: H: 7.2 cm. AR: 0.8 cm. Clay: 2.5 YR 5/6, red). Slip: (2.5 YR 5/6, red). Paste: It is composed of lime, sand, and silver mica, with a firm texture and dense porosity.
Nr.3: Dimensions: H: 11.9 cm. AR: 9.4 cm. Clay: (7.5 R 7/6 light red). Slip: (5 YR 8/3, pink). Paste: It is composed of lime, sand, and silver mica, with a firm texture and dense porosity.
Nr.4: Dimensions: H: 8.2 cm. AR: 9.6 cm. Clay: (5 YR 7/6 reddish yellow). Slip: (5 YR 7/6, reddish yellow). Paste: It is composed of lime, sand, gold and silver mica, with a firm texture and dense porosity.
Nr.5: Dimensions: H: 15.1 cm. AR: 8 cm. Clay: (7.5 R 7/6 light red). Slip: (2.5YR 8/3 pink). Paste: It is composed of lime, sand, and silver mica, with a firm texture and dense porosity.
Nr.6: Dimensions: H: 5.5 cm. AR: 8.2 cm. Clay: (2.5 YR 5/4, reddish brown). Slip: (2.5 YR 5/4, reddish brown). Paste: It is composed of lime, sand, and silver mica, with a firm texture and dense porosity.
Nr.7: Dimensions: H: 19 cm. AR: 6.4 cm. Clay: (2.5 YR 4/3 reddish brown). Slip: (2.5 YR 4/3 reddish brown). Paste: It is composed of lime, sand, gold and silver mica, with a firm texture and dense porosity.
Nr.8: Dimensions: H: 4.1 cm. AR: 20.4 cm. Clay: (5 YR 6/6, reddish yellow). Slip: (5 YR 7/4, very pale brown). Paste: It is composed of lime, and silver mica, with a firm texture and dense porosity.
Nr.9: Dimensions: H: 6.9 cm. AR: 9.7 cm. Clay: (2.5 YR 5/8 red). Slip: (2.5 YR 5/8 red). Paste: It is composed of lime, sand, and silver mica, with a firm texture and dense porosity.
Nr.10: Dimensions: H: 7.8 cm. AR: 5.6 cm. Clay: (2.5 YR 5/3, reddish brown). Slip: (2.5 YR 6/3, light reddish brown). Paste: It is composed of lime, sand, and silver mica, with a firm texture and dense porosity.
Nr.11: Dimensions: H: 8.1 cm. AR: 9 cm. Clay: (2.5 YR 5/4, reddish brown). Slip: (2.5 YR 6/6, light red). Paste: It is composed of lime, sand, and silver mica, with a firm texture and dense porosity.
Nr. 12: Dimensions: H: 5.9 cm. AR: 9.8 cm. Clay: (5 YR 6/6, light red). Slip: (5 YR 6/6, light red). Paste: It is composed of lime, sand, and silver mica, with a firm texture and dense porosity.
Nr.13: Dimensions: H: 7 cm. AR: 10.4 cm. Clay: (5 YR 6/6, reddish yellow). Slip: (5 YR 6/4, light red brown). Paste: It is composed of lime, sand, and silver mica, with a firm texture and dense porosity.

³ **Nr.:** Number, **H:** Height, **AR:** Mouth Diameter.

Nr.14: Dimensions: H: 12 cm. AR: 22 cm. Clay: (5 YR 6/4 light reddish brown). Slip: (5 YR 6/6, reddish yellow). Paste: It is composed of lime, sand, and grit, with a medium texture and dense porosity.
Nr.15: Dimensions: H: 10.8 cm. AR: 11 cm. Clay: (2.5 YR 5/8, red). Slip: (5 YR 6/4, light reddish brown). Paste: It is composed of lime, sand, and silver mica, with a firm texture and dense porosity.
Nr.16: Dimensions: H: 8.7 cm. AR: 6.2 cm. Clay: (2.5 YR 6/4 light reddish brown). Slip: (2.5 YR 6/4 light reddish brown). Paste: It is composed of lime, sand, and silver mica, with a firm texture and dense porosity.
Nr.17: Dimensions: H: 9.8 cm. KR: 2 cm. Clay: (7.5YR 6/4, light brown). Slip: (7.5YR 6/4, light brown). Paste: It is composed of lime, sand, and silver mica, with a firm texture and dense porosity.
Nr.18: Dimensions: H: 12.1 cm. AR: 10.4 cm. Clay: (5 R 5/4 weak red). Slip: (7.5 R 5/4 weak red). Paste: It is composed of lime, sand, gold, and silver mica, with a medium texture and dense porosity.
Nr.19: Dimensions: H: 60 cm. AR: 9.4 cm. Clay: (10 R 5/4, weak red). Slip: (10 R 6/4 pale red). Paste: It is composed of lime, grit, and silver mica, with a medium texture and dense porosity.
Nr.20: Dimensions: H: 19.5 cm. AR: 8 cm. Clay: (2.5 YR 6/4, light reddish brown). Slip: (2.5 YR 6/4, light reddish brown). Paste: It is composed of lime, sand, and silver mica, with a firm texture and dense porosity.

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Roman Market Integration and Transport Amphorae in the Eastern Balkans, 4th-7th c. AD: Preliminary Thoughts

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Abstract

The question of integration looms large in current discourse around the Late Roman Empire: was it composed of micro-regional economies prioritizing self-sufficiency, or were Roman markets characterised by lasting, substantial trade connections? This is a question of connectivity, imperialism, and the economic impact of sociality, and answers have varied widely.

In this early element of an ongoing doctoral project, I address two related issues. The first is connectivity, a concept often deployed but rarely well-defined. I propose a framework for assessing and defining Roman economic connectivity through archaeology. This will find use in this project's second intervention: analyzing economic integration in the Late Roman eastern Balkans by assessing the inter-provincial linkages evinced by assemblages of transport amphorae - in this case, from Halmyris (Romania) and Iatrus (Bulgaria). In short, how consistent and dense were the flows of goods imported to the eastern Balkans?

These questions lead - briefly here, with more detail to come in future work - to identifying trends and investigating in greater detail the socioeconomic and other trends that are at least partly responsible for Roman connectivity and for differences in sites' levels of connectedness.

Introduction: Integration and Connectivity

That the various components of the Roman imperial world were connected to some degree is uncontroversial. Ceramics distribution maps, though potentially misleading, nonetheless highlight the capacity of objects to move - often in large numbers - throughout the provinces composing the Roman Empire (cf. Karagiorgou 2009). However, controversy exists regarding the extent to which these provinces were connected, or integrated.

Integration refers to the extent to which markets are bound together, reducing trade barriers, and as such is effectively connectivity through an economic lens. The European single market is perhaps the clearest modern example, with the economic consequences of Britain's withdrawal from the EU serving as the premier example of integration's benefits. Integration is an open question for a premodern

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empire precisely because integration is not guaranteed simply because of political unification, which is itself a term only loosely applicable to many premodern contexts.

Some scholars argue that the Roman Empire was largely composed of self-sufficient provinces, which engaged in trade only sporadically (e.g., Paterson 1998; Bang 2008; Tchernia 2016). This view holds, in part, that the Roman Empire was too weak a cohesive force to properly lower trade barriers and foster trade between regions. Others argue the opposite, that the norm for the Roman Empire was connectedness and integration, with changes in one province affecting the fortunes of others to a not insignificant degree (e.g., Rubio-Campillo *et al.* 2017; Temin 2001; Temin 2013). In this light, the political and economic force exerted by the Roman Empire sufficiently lowered barriers to trade (e.g., through subsidies for shippers and through imperial decree mandating inter-provincial supply) that inter-provincial trade could flourish sufficiently to consider the Empire integrated to some extent.

This situation gives the appearance of an impasse. However, the impasse lies with a more thorny problem, a theoretical and methodological issue which extends into contemporary discussions of connectivity as a theoretical construct. To speak of connectivity, we first need a substantial, agreed-upon, useful (i.e., non-tautological) definition of connectivity. The same applies to integration - if no agreed-upon thresholds for, or measurements of, integration exist for premodern data sets, then different scholars can make wildly divergent claims from identical data sets or from data sets derived from interrelated phenomena. This - to put it informally - talking past one another is the chief source of this debate.

To properly understand and evaluate the state of ancient connectivity, it is imperative to establish a means of evaluating and measuring market integration in the archaeological record in a reasonably objective, explicit, and context-specific way. This entails not only emphasizing measurable data, rather than impressions, but also - most importantly - recognizing that integration is a spectrum. It is not something that is either had or not had, but rather something that is had to different degrees, in different industries, which can be described differently in different contexts. A site may be well-connected in a provincial context, but a backwater globally; a province may be regionally important, but only moderately relevant empire-wide. Borrowing loosely from economics, with these observations held in mind, a possible intervention can be suggested.

Integration is typically measured in two ways: price equality and/or the volume of trade. In two integrated markets, prices will be more or less equal and will change together. The similarity in goods prices is, admittedly, 'a truer measure of market integration' than trade volume (Irwin 1996: 43). However, price data are nonexistent for the vast majority of archaeological contexts. The best option, then, is to turn to the movement of trade goods, a process that is archaeologically visible, albeit imperfectly so. The flow of goods between two markets is sufficient to identify those two markets as integrated (Irwin 1996; Knetter and Slaughter 2001), for if there were barriers to trade, trade would either not occur at all, or would occur only in small, infrequent bursts. The basic questions, therefore, are: What volume of trade is occurring between discrete markets? What is the significance of a given volume of trade? Lastly, for what markets is trade occurring?

To answer these questions, we may turn to product-market integration, in which integration is measured through trade volume (Knetter and Slaughter 2001: 15-20). Within this type of integration, the concept of trade-thickness offers a means to evaluate connectivity. Trade-thickness is the percentage of possible trade flows for which trade actually occurs (Knetter and Slaughter 2001: 30-31). In the modern world, this is determined based on country and industry, using readily available data. The resulting figure expressing the trade-thickness for a given country in a particular industry and year provides a reasonably objective, easily-compared expression of trade flows. With a set of these data (for various countries, industries, and/or years), changes over time and/or space can be reliably identified and assessed.

For the ancient world, some adjustments are needed to put this concept into practice. In a Roman context, for example, provinces are made to stand in for countries. The helpful abstraction of a 'market', i.e. the composite of economic activity happening in a given region, can be easily transposed to a Roman imperial context. In such a context, the term would continue to refer to the sum of economic activity occurring in a given region, in this case a province. However, unlike the modern world, data for ancient trade will necessarily be incomplete, regardless of excavation and publication thoroughness and quality. There are no simple solutions for this other than an awareness that any conclusions from available data sets will necessarily be tentative.

Thoughts on Methodology

With these adjustments and compromises in mind, a method for evaluating integration may take the following form, with the archaeological record of the Eastern Balkans from the 4th to early 7th century AD serving as an example. The markets for this period can be enumerated using textual sources, namely, the *Notitia Dignitatum* for the early 5th century ($n = 116$, 59 in the West and 57 in the East), Hierocles' *Synekdemos* for the end of the 5th century ($n = 64$), and Justinian's *Novella viii* (per Jones 1964: 381, 386-89) for the mid-6th to early 7th centuries ($n = 92$). That list will form the base for the 'total number of possible trade connections' figure (aka 'percentage of provinces represented in an assemblage of amphorae'), with the assumption that each province can engage in trade with every other province. This analysis will operate mainly at the province level, though finer-grained analysis is possible. Type of site (i.e., predominantly military or civilian in character) and geographic location (i.e., coastal, riverine, or inland) will likely prove relevant to analysis, so space will be made for analysis along these axes as well, comparing coastal to inland levels of connectivity, for example.

Now that the total number of possible trade connections at a given point in time is known, we may turn to a particular site. The amphorae data from a given site - types, fabric and other origin-identifying details and quantities, where available - will be used to establish a list of the provinces whose production is attested by the amphorae at the site, while retaining periodization. For example, Late Roman 2 amphorae, whose production is attested on the Aegean islands, would represent exports from that Roman province - in this case, *Insulae*. A number of ceramic forms were produced in multiple provinces.

For example, the nearly-ubiquitous Late Roman 1 amphora was produced on Cyprus and Cilicia (southern Türkiye). Without clear indicators of production location for specific amphorae, all possible production sites will be included in the forthcoming analysis. Given that in all cases, these multiple provinces are geographically contiguous - or in the case of Cilicia and Cyprus, as closely linked as possible - this should not overly confound the analysis. For each period, the percentage of provinces represented in an assemblage - and their specific quantities, data permitting - will be calculated to establish a single 'trade-thickness' measure identifying the number of possible provincial connections at a given site within a given timeframe.

With trade-thickness figures for a sample population of sites in the provinces of Scythia Minor, Moesia II, and Haemimontus ($n = 27$, at present) - a region corresponding to the Romanian Black Sea coast along with north-central and eastern Bulgaria - a baseline for trade in the area can be established. This baseline would have roughly century-level resolution, accounting for existing sources and stratification differences between excavations. Establishing a baseline will entail using basic statistics to find the mean and standard deviation of the trade-thickness figures for the sample, as well as for subpopulations sorted by geographic feature and site type. These figures will allow for intra- and interregional comparisons: how does the mean connectivity for the study region compare to notable urban centers across the Roman Empire, for example, or how does the mean for inland Balkan sites compare to that of coastal sites? Most importantly, what do those differences mean?

This admittedly simple analysis is not intended to be a final result in and of itself; rather, it is intended firstly to direct research towards trends that deserve greater sociohistorical explanation, and secondly to provide a set of figures to contribute to comparisons with other sites across time and space. Trade-thickness as a metric is very broadly applicable, irrespective of era or political/economic structure, and even in the face of imperfect data sets, as the project of which this chapter is a small part intends to show.

Case Study, Part 1: Iatrus and Halmyris

The available data from the German-Bulgarian project at Iatrus (modern Krivina, Bulgaria) and the Romanian project at Halmyris (near modern Murighiol, Romania) will suffice to illustrate this simple method and its benefits, along with the kinds of further research it prompts.

The Iatrus-Krivina publications, spread over six volumes, are notable for the richness of the data sets presented (e.g., Conrad 2007). The quantification and stratification of each amphora type allow for easy tabulation of data for each amphora, and therefore for each possible province of origin. Figures 1 and 2 present the results of this tabulation, first for each type presented in the publications, then for their corresponding provinces of origin. Without detailed petrographic data, some of these forms will necessarily represent multiple provinces.

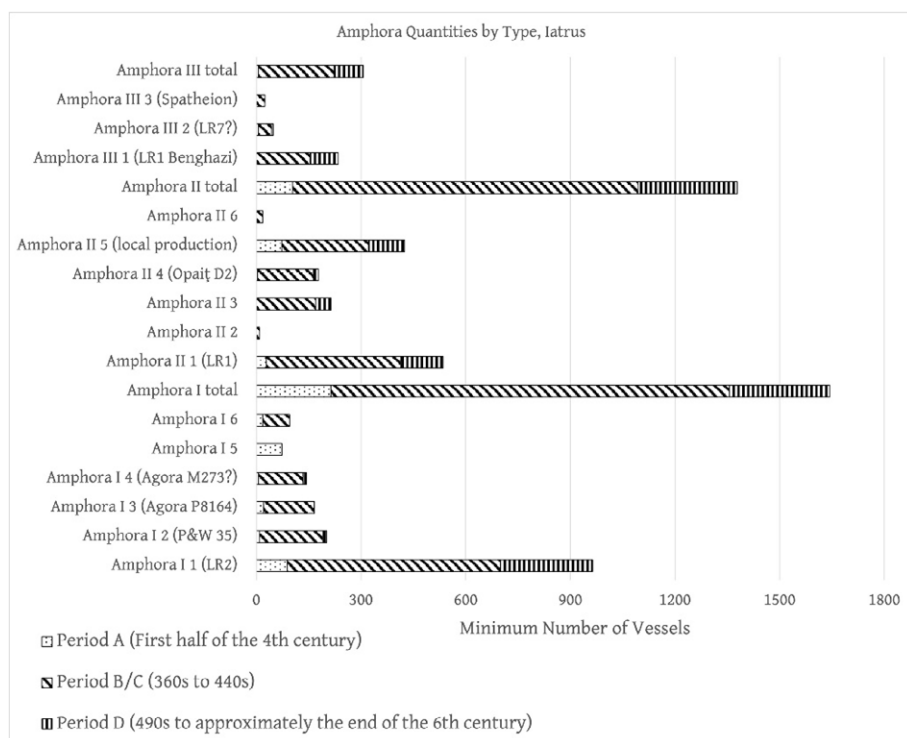


Figure 1. Iatrus amphora quantities by type. The more commonly-used typologies are included in parentheses (Data from Conrad 2008).

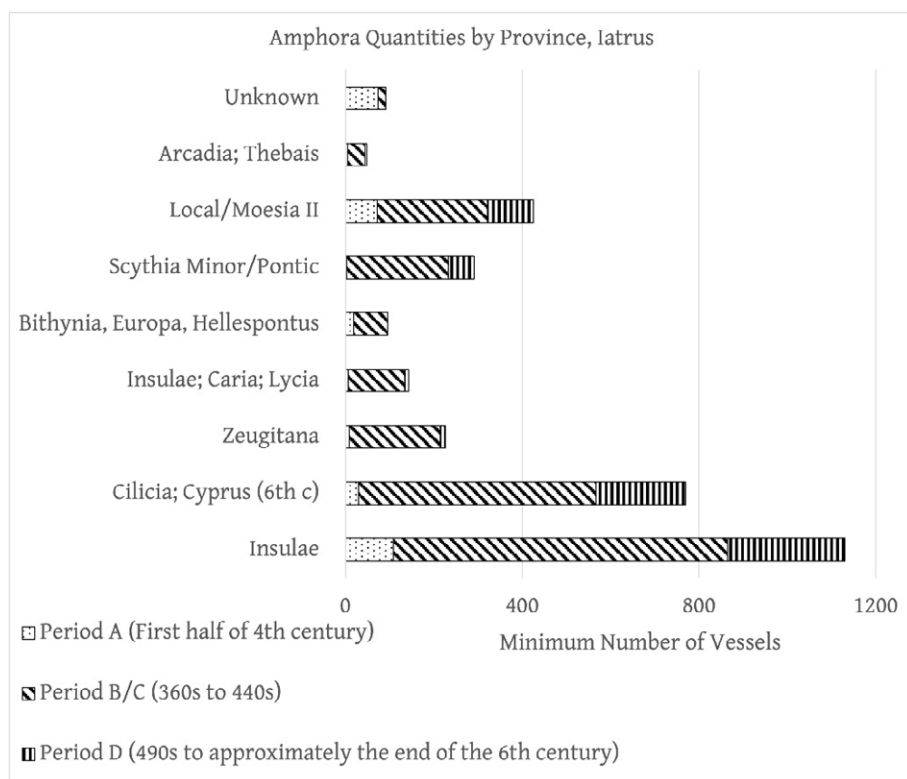


Figure 2. Iatrus amphora quantities by provinces of origin (Data from Conrad 2008).

With these data, it is easy to calculate approximate trade thickness. For Iatrus, a potential 14 distinct provinces are represented over the course of the site's occupation between the 4th and 6th centuries. In the 4th and 5th centuries AD (Periods A-C), 11-13% of eastern provinces are represented, with that percentage dropping to roughly 7% in the 6th century (Period D). The following question, of course, is what those percentages indicate - is this a considerable or an insignificant figure?

These figures' value will only be apparent after similar analysis on as many other sites as possible, to establish a baseline. At the same time, the usefulness of this single data set taken individually is primarily in prompting questions of change and consistency within the site over time. Namely, the consistent dominance of the Aegean islands, the relevance of local/intra-eastern-Balkans trade, the late appearance of Cypriot imports (in Period D), and the consistent trickle of imports from North Africa emerge in the course of this site analysis as questions worth pursuing. These questions may continue to be relevant as data from other sites are incorporated.

Adding the more high-resolution data from Halmyris provides a hint of what the baseline for connectivity may look like - albeit after much more data has been added. Topoleanu (2000) has collated the work done by previous scholars, most notably Opaïț (1991), providing the quantified amphora data ideal for present purposes (Topoleanu 2000: 128-76). Figure 3 presents the collected data from Halmyris, allowing for comparison between Halmyris and Iatrus. Halmyris features amphorae from around 18 possible provinces; 22% of eastern provinces and 19% of total provinces are represented, indicating greater diversity of connections at Halmyris than Iatrus. In contrast with Iatrus, where Period D evinces a narrowing of imports, the first half of the 6th century at Halmyris entails less of a change in the pattern of imports and the overall number of importing sites.

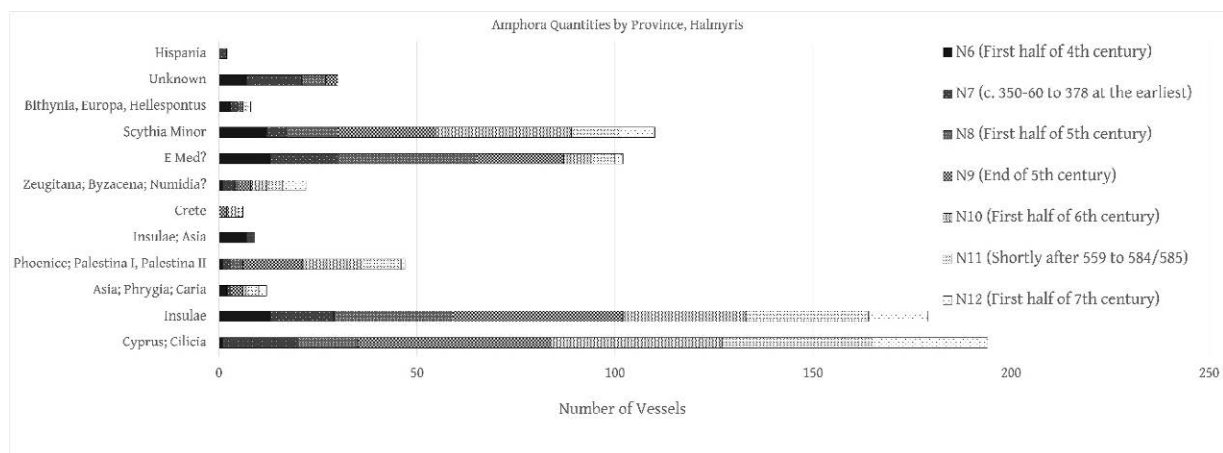


Figure 3. Halmyris amphora data by provinces of origin (Data from Topoleanu 2000).

A Note on Dating

Dating between the two sites is, naturally, distinct, with different periodization schemes. However, thanks to similar - though not identical - historical pressures and trends, many of the phases are roughly

comparable. Halmyris N6 and 7 roughly correspond to Iatrus Period A, from the early 4th century to the second third of the same century. Period B/C begins around 360-70, a decade or two before N8. Both periods end at roughly the same time, corresponding to the Hunnic invasions of the 440s. Period D corresponds to N9-11, from the end of the 5th century to the end of the 6th. N12 has no parallel at Iatrus. The question of dating will be relevant - and the answers subject to change - throughout this project, as more sites are incorporated. As a result, a somewhat flexible, or lower-resolution, approach to the dating scheme may be necessary, in order not to rely on any single site's periodization, but instead to incorporate a number of sites' discrete periodizations into a single analysis.

Case Study, Part 2: Inter-site Comparisons

The questions raised from Halmyris' data set correspond largely to those from Iatrus, namely that of the consistent long-term dominance of Aegean imports, the timing of the appearance of Cypriot goods, and the consistent trickle of goods from North Africa. The growth of trade with the Levant (specifically, the provinces of Phoenice and Palestina) in periods N9 and N10 (end of the 5th century to AD 559, corresponding roughly with Iatrus Period D) is not shared with Iatrus. For now, these are trends and inter-site distinctions that will be kept in mind for future study.

Having said that, a few possible explanations may be ventured, to be tested against larger datasets incorporating more sites. Clearly the *Quaestura exercitus* plays a significant role. This administrative region, organised by Justinian in 536, united the eastern Balkan provinces of Moesia II and Scythia Minor with Cyprus and the Aegean islands (Insulae), with the final two provinces burdened with supplying the first two. That these two provinces see an uptick in exports to Halmyris during Periods N9-11 is no surprise. Cause for greater consideration is the massive amount of amphorae from the Insulae in Period B/C, a period prior to Justinian's 536 organization, at Iatrus. This implies that Aegean Island exports were not universally boosted by the *Quaestura exercitus*, and that additional explanations should be sought. Perhaps sites in Moesia II and Scythia Minor evince different trade patterns despite being administratively unified in the 6th century, or perhaps coastal settlements were richer in imports. This question likely hinges on factors of geography and site type, discussed briefly below.

Perhaps more interesting are the trends incorporating other provinces. The trickle of African goods points initially to the distinction between shipping routes through the Adriatic (connecting the western Balkans to the rest of the Roman world) and those running through the Aegean (serving the eastern Balkans). The western Balkans see a steady flow of African imports (most frequently Africana III amphorae) throughout these centuries, particularly the earlier periods (cf. Pešić 2019). This stands in contrast to the eastern Balkans, which typically receive far fewer African imports, and points to different mechanisms moving goods between the two regions, even after Justinian's reconquest of both North Africa and the Adriatic provinces. Despite this distinction, the consistency of African goods points firstly to shipping routes that encompass North African markets, in addition to the more prominent and well-known routes connecting the Levant with the Black Sea via Cyprus and the Aegean. Despite there

being only a few examples, the consistency of African goods across periods points to the possibility of trade that is more organised than simply occasional opportunistic trade.

Additionally, the appearance of Levantine goods in Halmyris and not in Iatrus, if not due to differences in excavation/data recovery/preservation/identification, would seem to point to differing patterns of trade, an observation that correlates to differences in Aegean imports between the two sites. As more sites are studied, the exact nature of these differences, and the reasons for them, will become clearer. The comparison between Halmyris and Iatrus indicates a greater diversity of finds at Halmyris, with a greater variety of provinces represented. As one of the major questions of this project is the impact of geography on connectivity and trade, these distinctions may be attributable to Halmyris' position on the Black Sea coast, compared to Iatrus' position along the Yantra river, 2km south of the modern Danube (of which the Yantra is a tributary) and roughly 250km inland from the Black Sea coast. Modern land reclamation along the Danube means that Iatrus was likely somewhat closer to the Danube in Antiquity, though not immediately on the river (Poulter 2000: 333). Its position along the coast places it along trade routes connecting northern Africa, the eastern Mediterranean, and the Aegean with the Pontic coast. This optimal positioning on the coast and near the mouth of the Danube would likely have made Halmyris an essential port along these trade routes, perhaps with a distributive role.

The nature of the settlements likely has additional explanatory power, if not for Iatrus and Halmyris specifically, then certainly for other settlements to be explored. Iatrus was originally a fort, seemingly designed for purely military purposes in the first half of the 4th century. Between the 350s and 440s (Period B/C), the site appears to take on a mixed military and civilian character, more akin to a fortified settlement, with a significant number of 'irregularly planned farmsteads' (von Bülow 2007: 466-67). This situation appears to have continued into the 6th century, after the destruction separating Periods B/C and D, when Theophylact Simocatta refers to Iatrus as a *polis*. This was a period in which settlement contraction - the condensing of civilian life inside pre-existing fortifications - was the norm (von Bülow 2007: 470-74, citing *Historiae* 7. 13; for contraction, see Conrad 2006: 318; Kirilov 2007; McCormick 2001: 33-34). Halmyris featured a sizeable civil settlement in addition to its military infrastructure (Topoleanu 2000: 262-63). If study of the architectural remains indicates that Halmyris was more civilian than military in character, this distinction, in conjunction with geographic factors, may explain Halmyris' higher degree of connectedness than that of Iatrus. If there is no clear distinction between Iatrus and Halmyris' civil/military makeup, then geography must play a more significant role.

The two axes of distinction described above, geographic location and site type, are both open questions. While comparisons between individual sites, as above, can be illuminating, they are not the final aim. The broader trends amongst the entire sample are far more interesting. Because geographic location and site type are both nominal variables, chi-squared tests can be used to indicate association between trade-thickness and site type or geographic feature, once a sufficiently large dataset is available.

Future Aims

This study is a nascent one, and the components presented here are preliminary in nature. The aim of this work is to contribute to current debates surrounding the connectedness of Roman imperial provinces, using the Late Roman eastern Balkans as a case study. Given that reasonably non-subjective, evidence-based, repeatable evaluations of ancient connectivity are still somewhat uncommon (Temin 2013 forming a notable exception), this work proposes the use of trade-thickness measures to estimate the number of linkages between provinces in different periods. This, in turn, enables measurements of connectivity and comparisons between sites to identify important trends and the relative importance of factors like geography and site type. Most importantly, these results are intended to prompt future analysis of the historical, socioeconomic, and political factors driving the trends identified, some of which have been briefly hinted at in the preceding pages.

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Reflections on the Roman Cultural and Commercial Relationship Network of the Mediterranean from Andriake Amphorae

Beste Tomay¹

Abstract

Andriake, the harbour neighbourhood of Myra, the metropolis of the Lycia Region throughout antiquity, was one of the most important stopping points for Mediterranean trade from the Classical Period until the end of Late Antiquity. As a natural consequence of the international maritime trade, excavations in the settlement yielded a wide variety of commercial amphorae from many centers from the Eastern Mediterranean to the Western Mediterranean from the 1st century BC to the 7th century AD.

However, this study focuses on Roman amphorae and on Andriake's position in the ancient Mediterranean geography, its hinterland, and the result of the relations filtered through its political, economic and social networks. Andriake forms used for the transportation of various goods – in particular wine, olive oil and garum – in the Roman Period are Dressel 2-4, Lamboglia II, Forlimpopoli, Kapitan II, Agora M 54 and Dressel 30 forms, which prove commercial ties with Western Anatolia, the Western Mediterranean, the Adriatic coast, North Africa and Cilicia.

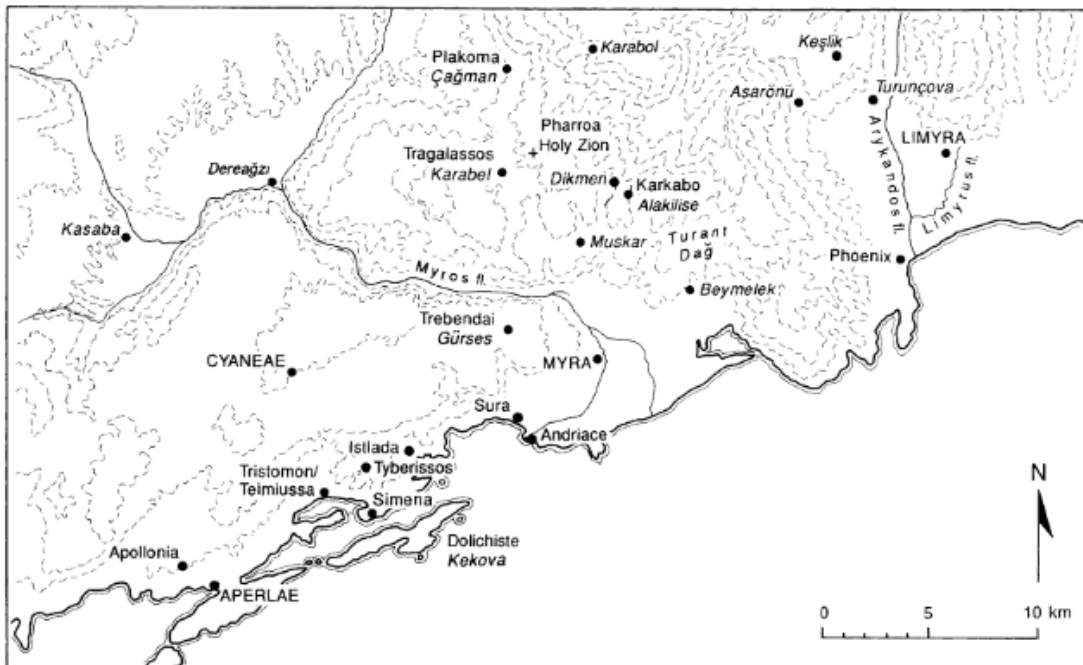


Figure 1. Location of Myra and Andriake (After Foss 1994: Map II).

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Introduction

Myra, one of the important metropolises of the Lycia Region, is located in the Demre district of Antalya Province today (Figure 1). Strabo described Myra as a city built on the summit of a high hill 20 stadia (about 3.5km.) from the sea and stated that it was one of the six cities of the Lycian Region, which had three voting rights in the union (*Geographia*, 14. 3. 7). 'Andriake, known as the harbour quarter of Myra, is a settlement built to the north and south of an inner harbour formed in the region where Andriakos reaches the sea (Borchhardt 1975: 64), 4.7km (Çevik 2022: 393; Çevik and Bulut 2010; 2022: 8)² as the crow flies from the city. However, Pliny (*Naturalis Historia*, 5. 100) mentions Andriake as a city with the name 'Andria Civitas'. In addition, Andriake is mentioned in ancient sources as the harbour of Myra, an ἐμπόριον (emporion) (Anrich 1913: 10; Liddell and Scott 1996: 548 'ἐμπόριον'; Çevik and Aygün 2019: 878; Aygün 2018: 169; Çevik and Bulut 2022: 26), i.e. trade centre, or ἐπίνειον (epineion) - port/anchorage (Anrich 1913: 1; Liddell and Scott 1996: 647 'ἐπίνειον' Appian 4. 10. 82; Praxitelis 1; Leonard 1997, 164-5; Çevik and Aygün 2019: 878). It was one of the most important commercial centres of the region from the Classical Period until the 7th century AD, coexisting simultaneously with the main city of Myra (Figure 2).



Figure 2. Andriake drone photo (Myra-Andriake Excavations Archive).

Although some ceramics, stamped amphora handles and coins (Bulut and Şengül 2014) were recovered from the Hellenistic Period, more information is available from the Roman Period. In addition, the most important document for the economy and trade of this period is a customs inscription, one of three

² This measurement is based on the distance between the theatre of Myra and Horrea Hadriani in Andriake.

such inscriptions found in Asia Minor. This inscription is the biggest indicator that Andriake's trade law, economic control and harbour served on a large scale. Accordingly, there are certain rules and regulations for the transport of goods (see Takmer 2006). The Horrea Hadriani (Çevik and Bulut 2010: 27-8), built in AD 129 by order of Emperor Hadrian, is one of the most important commercial public buildings of Andriake. The presence of two imperial silos built simultaneously in Andriake and Patara in Lycia proves the importance of the region's trade route in the Mediterranean world. It is known that most commercial activities in Late Antiquity were carried out by imperial order. When Horrea Hadriani is evaluated in terms of architectural and archaeological finds, it can be seen that the building was also used in Late Antiquity.

Roman Amphorae from Andriake

Andriake, the harbour of Myra, has provided very important data from the Hellenistic and Roman Periods, mostly from Late Antiquity. The excavations carried out in Andriake since 2009 by Prof Dr Nevzat Çevik have uncovered many public buildings in the southern settlement. In addition to structures such as Horrea, agora, shops, baths, monuments, offices, tombs, churches, synagogue, murex and wine workshops, which are the best evidence of trade and the annona system, commercial amphorae were discovered. There is a rich repertoire of commercial amphorae dating from the Hellenistic Period to the end of Late Antiquity. The fact that all these amphorae are found in quite different numbers in themselves has led to different considerations. In this study, the forms used intensively in trade during the Roman Period will be introduced. The results obtained from the evaluation of six forms in total shows that these amphorae, which have a high carrying capacity, may have transported wine, olive oil and garum, while the fact that they were found in such small numbers can be explained by the destruction of amphorae in Andriake in later periods. Considering the fact that Andriake was used until the end of Late Antiquity, the number of amphorae from the Roman Period could be limited due to Arab raids, earthquakes, etc. It is noteworthy that some of the amphora forms are found almost in single finds alone.

Dressel 2-4

The Dressel 2-4 amphorae, known to have been produced for wine transport from the 1st century BC in Italy until the 3rd century AD (Şenol 2003: 46), are also known by different names in the literature³. In terms of form, they have a flaring rim and cylindrical neck, a thin groove between the shoulder and neck, twin cups with vertical corners starting from the bottom of the rim, a conical body without grooves that narrows towards the bottom, and a pointed, filled bottom (Zevi 1966: 208-247, Pl. 77-81; Riley 1979: 150; Peacock and Williams 1986: 105; Bezeczky 1987: 4; Vidrih- Perko 1999: 9, Fig. 2; Şenol

³ Koan Amphora, Peacock & Williams 10, Ostia LI, Augst 5, Camulodunum 182-3, Zeest 61, Kelemen 1, Callender 2, Carthage Early Amphora 5, Bruckner Type 6, Benghazi ER4, Lamboglia 51, Dyczek Type 1, Bezeczky Type 32.

2000: 128-9; Panella 2001: 194; Şenol 2003a: 47; Williams 2004: 444; Şenol 2009: 137). Their average height is 80-90cm and they have a capacity of 25-35 litres. The earliest examples of Dressel 2-4 amphorae, which were produced as prototypes (Peacock and Williams 1991: 106) in Kos in the 3rd century AD, were found in the western Mediterranean in the first half of the 1st century BC (Sealey 1985: 127-30; Peacock and Williams 1986: 105-7; Laubenheimer 1989: 120-1; Becker 1989: 578; Empereur and Picon 1989: 225-6; Peacock and Williams 1991: 106; Whitbread 1995: 81; Moore 1995: 3; Bezeczky 1997: 163; Şenol 2000: 129; Panella 2001: 199; Şenol 2003a: 22; Rauh 2004: 330; Ferreras 2007: 73; Ballester 2009: 562; Laubenheimer and Schmitt 2009: 43-4, 61-62; Şenol 2009: 137, Lavarone and Olcese 2013: 221-6; Rizzo 2014: 223-8, 237-8).

Produced in regions such as Campania, Lazio and Pompeii, the fabric of Dressel 2-4 amphorae is coarse fired, thick walled and tempered with abundant black sand, volcanic rock, quartz and biotite, green augite crystals (Peacock and Williams 1991: 107) as seen in Dressel 1 amphorae and the clay colour is 5 YR 7/4, 5 YR 8/4, 5 YR 7/6, 2.5 YR 6/8, 2.5 YR 6/6-6/8 with slip colours 7.5 YR 7/4, 7.5 YR 8/4 and 7.5 YR 7/2, 7.5 YR 8/2 (Şenol 2000: 129). It is known that there are many imitations of this form. The fact that its origin was Kos and that the Pseudo Kos form was accepted even in the regions where Hellenistic Kos amphorae were imported is explained by the increasing Romanisation process in the region (Empereur and Hesnard, 1987: 36; Moore, 2011: 97). The form was intensively produced until the 2nd century AD, after which it was suddenly discontinued (Moore 1995: 3). Examples of Dressel 2-4 amphorae with stamps on the neck, handle or base are also found (Kızırlarşanoğlu 2016: 125). The distribution area of Dressel 2-4 amphorae produced in Campania is known to extend from England to the Eastern Mediterranean, the Red Sea and India (Peacock and Williams 1991: 106).

A total of 23 Dressel 2-4 amphorae have been recovered from Andriake since 2009. The area where they were found most intensively is the wine workshops, which have a later date than the materials. They were found to be of Italian production due to the abundant black sandy, coarse baked and 2.5 YR 6/8, 2.5 YR 6/6-6/8 coloured clay (Plate 1, Numbers 1, 2; Cat. Nos. 1, 2).

Lamboglia II

Lamboglia II amphorae⁴, known under different names in the literature, are one of the forms produced in Italy and the Balkans from the 2nd century BC to the 1st century AD. First introduced to the scientific world by N. Lamboglia, this type of amphora is defined under Group 2 (Lamboglia 1955: 262-3, Fig. 17-18). Morphologically, it has a slightly protruding thickened rim, triangular to square in profile and a high cylindrical neck with a thick oval handle. It has a very thick-walled, bag-shaped body with a prominent protrusion on the shoulder. Sometimes there is a stamp on the rim and on the handle. It has been found in the western Mediterranean in the southern part of Spain (Beltrán Lloris 1990: Fig. 113). It is known that this form was used especially in the trade of wine produced in Southern Italy to the

⁴ Apani 1, Baldacci 1, Peacock & Williams 8.

Eastern Mediterranean (Formenti *et al.* 1978: 95-100). In the light of the samples recovered from the shipwreck of Giens with resin and a preserved cork stopper on the rim, it has been confirmed by archaeometric analyses that wine was transported with this form (Formenti *et al.* 1978: 95-9). The Aegean coasts (Grace 1961: Fig. 36), Carthage (Cintas 1950: 321), Adriatic coasts (Zevi 1967: 21-31), Athens (Grace 1961: Fig. 1), Cisalpine coasts (Baldacci 1972: 1011), and Kekova underwater surveys (Aslan 2015: 332) are among the centres where this form was found. Only one Lamboglia II amphora has been found at Andriake with a stamp on it (Plate 1, Number 3; Cat. No. 3).

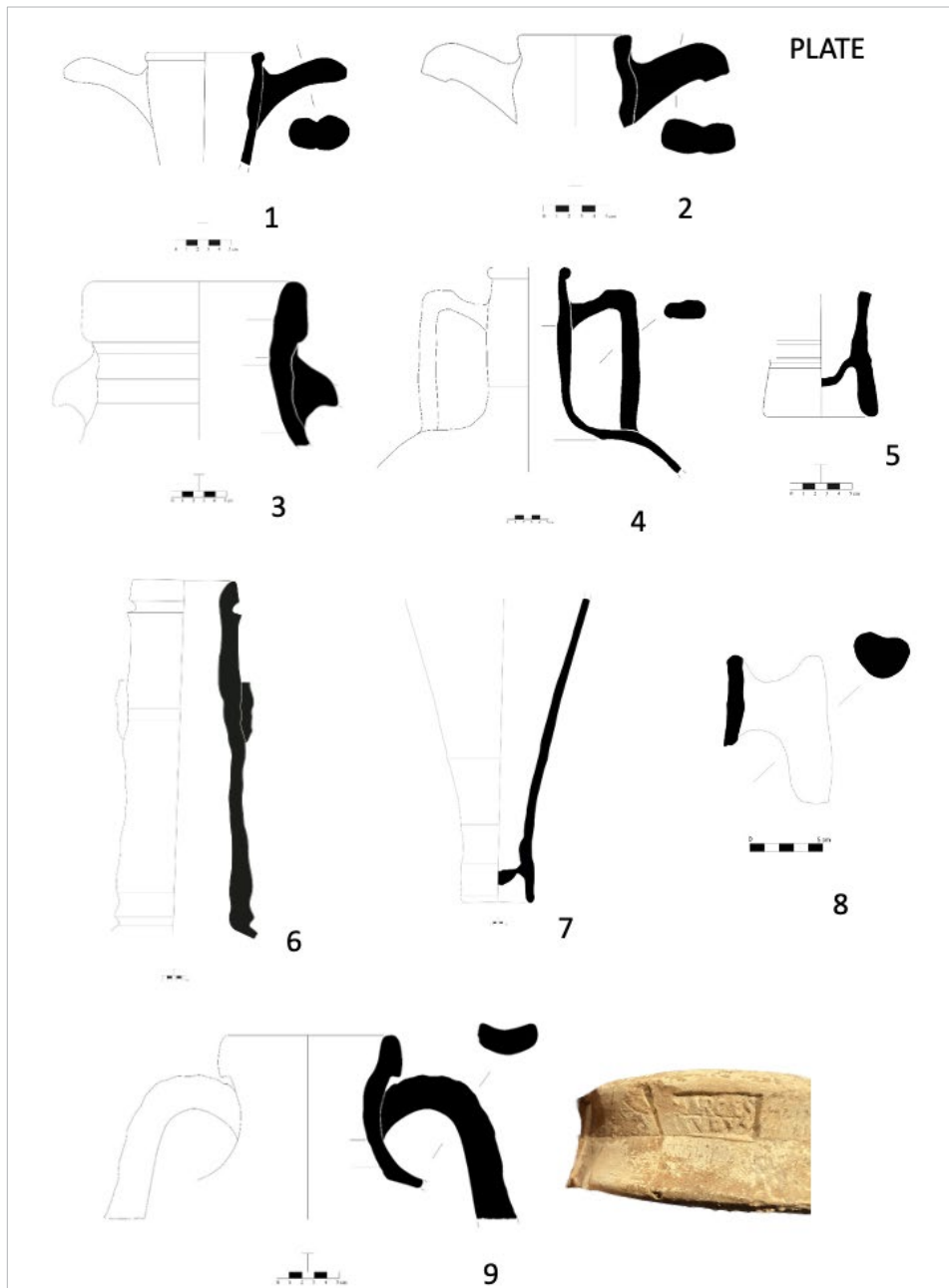


Plate 1.

Forlimpopoli

Named after the town of Forlimpopoli in north-western Italy, the form has several other names in the literature⁵. It is thought to have been produced between the mid 1st and mid 3rd centuries AD (Aldini 1999: 23), and to have originated in Italy and Northwest Europe. In the study conducted by T. Aldini, this form, which was used for transporting the wine of the region, was divided into five main types, A, B, C, D, E, and type A into two variations, A1 and A2 (Aldini 1999: 24). This flat-bottomed type is named after the north-eastern region where the kilns that produced it were located. All sub-types have a flat base with a diameter roughly equal to that of the neck. In types B and C the base widens slightly outwards. The body is oval and tapers downwards, but the body of subtype C is more rounded than the other three types. The neck is conical (although cylindrical in subtypes A and D) with a simple rounded rim (slightly everted in type B). The handles rise vertically from the rounded shoulder and peak slightly above the junction with the neck in subtypes A and B: subtypes C and D are more steeply angled. The handles in cross-section are usually ribbed, long and resting on the bulging shoulder.

There is only one example of the Forlimpopoli form from Andriake. With preserved rim, neck and handles, it belongs to type D. Noviodunum (Gamureac 2017: 302 *et seq.*) and Patara (Dündar 2018: 169, Fig. 5) are among the places where this form was found. The discovery of this amphora at Noviodunum has been interpreted by the researchers as suggesting that it may have been used for the Roman army or rich civilians, for offering to Jupiter at a festival such as *vinalia* or for a funeral ceremony (Gamureac 2017: 305). There is only one example of a Forlimpopoli amphora recovered from Andriake. It is in D form with a rounded rim, high neck and a fluted vertical long handle (Plate 1, Number 4; Cat. No. 4).

Kapitan II

The *Kapitan II*⁶ amphorae, which are known by many names in the literature⁷ and thought to have been produced in Western Anatolia, are among the important amphora types produced between the 2nd century AD and the end of the 4th century AD. From a morphological point of view, they have a slightly rounded or flat mouth, a conical, long and fluted neck, and vertical and thick handles that rise outwards from the shoulder and descend below the neck, often in a sharp curve near the lip, which is the most distinctive feature of the form (Riley 1979: 189; Dyczek 2010: 993).

⁵ Benghazi Mid Roman Amphora 13, Peacock & Williams 42.

⁶ The most common name of the form, *Kapitan*, was coined by G. *Kapitan* in 1961 (*Kapitan* 1961: 297, Type II), who gave a detailed description of the form in his 1972 study. For detailed information see (*Kapitan* 1972: 246, Fig. 4).

⁷ Agora K 113, August 54, Benghazi Mid Roman Amphora 7, Bezecky 44, Bjelajac XII, Dyczek Type 18, Egloff 168, Ephesos Type 44, Hollow Foot Amphora, Keay XII, Kelemen 21, Knossos 37, Kuzmanov VII, M 237, M 303, Niederbieber 77, Opait IV, Ostia VI, Peacock & Williams 47, Peacock 45, Robinson K 113, Radulescu 6, Popilian IV-V, Zeest 79.

The body tapers downwards and ends in a round base with a deep and hollow lower part and curved inwards. The paste is well fired, heavily micaceous with abundant and large calcite and chamotte (Şenol 2009: 175; Dyczek 2010: 994), generally grey and 2.5 YR 5/8 (Red), 5 YR 6/6, 7.5 YR 7/6, 5/6, 8/4, 8/4, 8/6 (Dyczek 2010: 994). The form is about 75cm in length, has a rim diameter of 6.5-7cm (Riley 1979: 189) and an average capacity of 15 litres (Bădescu 2013: 192). Although no workshop has been identified so far, the origin of the form, which is generally considered to be produced in Western Anatolia (Zeest 1960: 114; Kăpitan 1972: 243-52; Popilian 1974:137-46; Peacock and Williams, 1986: 193-4; Dyczek 1999: 113), has not been clarified. There are various opinions about the place of production based on the clay characteristics. Firstly, V. Grace (1971: 72, N. 51) suggested Samos as the production site of this form. P. Panella (1973: 598; 1986: 617) and S.J. Keay (1984: 137, 461, 393) suggested Kos as the production site of this form. However, Samos has been accepted by some researchers (Riley 1979: 192; Peacock and Williams 1986: 193; Sciallano and Sibella 1991: 99; Bjelajac 1996: 41; Bezeczky 2013: 25-33, 150).

The earliest examples of the form, which is generally known to have carried wine (Dyczek 2010: 993), date from the 2nd century AD at Ostia (Panella 1973: 596, 616-7; Carandini and Panella 1981: 487-503; Kelemen 1993: 65) and before AD 237 (Panella 1973: 596-7, 686) at Ain Sinu. The earliest amphorae found in Dacia are dated to the 2nd century AD and the latest to the beginning of the 4th century AD (Negru *et al.* 2003: 213). The ones found in the Marzamemi shipwreck are dated to AD 210-215 (Keay 1984: 140), while the Dura Europos samples are dated to AD 215-216 (Dyson 1968: 19). Although it is thought that the form was produced until the 4th century AD (Popilian 1976: 44-5), its exports decreased afterwards, 5th century AD examples were also found in the Athenian Agora (Robinson 1959: 111). Kăpitan II amphorae are known from Britain, Gaul, Spain, North Africa, the Adriatic and the Aegean (Popilian 1976: 44-5; Dyczek 2001: 141-3). The examples from Antandros (Rowe 2004: Fig. 97/1-2) and Constantinople (Asal 2010: 29), Ephesos (Outhscar 1998: 20; Bezeczky 2013: 150) are dated to the late 2nd - early 3rd century AD, while the examples from Erythrai (Kırkanlı 2021: 116) are dated to the 3rd century AD, and the amphorae from Knossos (Hayes 1983: 155), Phokaia (Firat 2019: 35), Colchester (Vilvorder *et al.* 2000: 481) and Lyon (Lemaitre 1995: 200) belong to the early 3rd - first quarter of the 4th century AD. The Kăpitan II amphorae recovered at Andriake, although few in number, are dated to the end of the 2nd century AD and the beginning of the 3rd century AD (Plate 1, Numbers 5-7; Cat. Nos. 5-7).

Agora M 54

The Agora M 54 form, known under different names in the literature⁸, has been recovered from many centres in the Eastern Mediterranean region (Şenol 2000: 92). It was introduced into the literature under the name M 54 among the amphorae of the Athenian Agora classified by Robinson (Robinson 1959: 89, Pl. 19). The general description of the form is a cylindrical body with an outwardly rounded rim, a short

⁸ Knossos 47, Neo Paphos 8 and Psuedo-Cos en cloche.

and wide neck, fluted, oval, bifid and spur-shaped handles extending from the rim to the centre of the body and a full conical base (Şenol 2000: 92-3). Due to the similarity of the bifid handle form, it has been likened to the Kos amphorae and called Bell-Shaped Pseudo Kos (Empereur and Picon 1989: 230-2). This form was produced in two types, large and small, and is known to have a capacity ranging from 13 to 20 litres (Şenol 2008: 113).

It is understood that the form was produced in Seleucia Pieria, Elaiussa Sebaste and Aigeai due to the production wastes identified by Empereur and Picon during the survey in Cilicia (Empereur and Picon 1989: 232; Empereur and Garlan, 1992: 13, Fig. 2; Abadie-Reynal 1992: 361; Şenol 2003: 126). It is also known that it was produced in Yumurtalık and Cyprus (Empereur and Picon 1989: 231; Sciallano and Sibella, 1994: Agora M 54 amphorae; Empereur 1998: 395). The Agora M 54 form was found extensively in the excavations in Alexandria, Delos, Cyprus and Athens in layers dated to the 1st century AD. In Paphos (Hayes 1991: 93, No. 31-32, Pl. 25, Fig. 3) in Cyprus, this form is dated to AD 125-150, while the examples found in the Agora of Athens (Şenol 2000: 92) are dated to the second half of the 1st century AD. The examples of this form found in Beirut are the latest known examples with variations dating to the 3rd century AD (Şenol 2009: 143). The materials carried in the Agora M 54 amphorae are thought to be wine (Sciallano and Sibella 1991; Empereur 1998: 395), fruit (Reynolds 2005: 564) and fish products (Opait 2007b: 104, Fig. 6). It is also known that the famous resinous wine of Cilicia was traded to centres such as Paphos (Hayes 1991: 93) and Kerameikos (Böttger 1992: 369-70) in the 1st-2nd centuries AD. Ephesos (Bezeczký 2004: 87; 2013: 81), Corinth (Slane 2000: 301), Delos (Empereur and Picon 1989: 231), Noviodunum (Honcu and Stănică 2019), Miletus (Hayes 1991: 93), Alexandria (Empereur 1998: 395; Şenol 2009: 144), Nea Paphos (Hayes 1991: 93), Beirut (Reynolds 2005: 564), and Marseilles (Rouge 1987: 151-70) are among the centres where this form was found. In Andriake, one handle fragment belonging to the Agora M 54 form was recovered. The analogy suggests that it may date to the end of the 1st century AD and the middle of the 2nd century AD (Plate 1, Number 8; Cat. No. 8).

Dressel 30

Dressel 30 amphorae,⁹ known to have originated in North Africa and Tunisia, were exported with great intensity to the Eastern Mediterranean market, especially from the 2nd century AD (Laporte 1980: 135). The Tunisian variant of the form is characterised by an outwardly thickened rim, a short and narrow neck with a flat and high lip, a conical body with nearly rounded (Laporte 1980: 131) handles that start just below the rim and converge below the neck, and a narrow and hollow bottom (Peacock and Williams 1986: 171). In general, the paste is 10 YR 6/2 (Light Brownish Gray) and grey, hard and abundantly tempered with sand, calcite, chamotte and mica (Peacock and Williams 1986: 172). Numerous examples of this form have been found especially in Galia (Brun 2003: 89) and Ostia (Laporte 1980: 132-4, Fig. 3). The distribution of the form is known to be quite widespread. The African coast, Egypt, Italy and Gaul

⁹ Agora K109, Augst 15, Class 38, Dressel 30, Keay 1A, Ostia 5, Peacock & Williams 38.

are among the centres where this form has been found. It is known that Tubucustu in Mauretania Caesariensis, one of the most important provinces of ancient Rome in North Africa, produced a significant amount of wine. This wine was traded in Dressel 30 amphorae, which are also unique to the region. The fact that the name of this region is printed as a stamp on the handles of this form shows how strong they were in this trade (Peacock and Williams 1986: 171). Only a single Dressel 30 form has been found during the excavations at Andriake so far, and it bears a stamp with the abbreviation of Mauretania Caesariensis on the handle (Plate 1, Number 9; Cat. No. 9).

Form	Date	Location of Production	Possible Substance	Capacity
Dressel 2-4	2nd half of the 1st century BC-early 3rd century AD	Western Mediterranean, Italy, Adriatic Coast	Wine	25-35 liters
Lamboglia II	2nd century BC-2nd century AD	Italy, Adriatic Coast and Balkans	Olive Oil, Wine	20-35 liters
Forlimpopoli	1-3rd century AD	Italy, North West Europe	Wine, Garum	9-15 liters
Kapitan II	2nd-7th century AD	Aegean, Western Anatolia, Greek Islands	Wine, Olive Oil, Sesame Oil	20-25 liters
Agora M 54	2nd half of the 1st century-2nd century AD	Cilicia	Wine and Fruit	35-40 liters
Dressel 30	3-4th century AD	Tunisia and North Africa	Wine	20-30 liters

Table 1. Roman amphorae of Andriake with period, location, possible product carried and capacity of the amphorae.

Conclusion

As a result of the excavations conducted at Andriake, it is evident that the Lycian region was actively involved in trade during all periods, as reflected by the varying densities of amphorae identified across different sectors. This richness provides a valuable basis for discussions concerning both typology and chronology. A wide range of forms dating from the Hellenistic period to the end of Late Antiquity has been documented. Although the number of amphorae dated to the Hellenistic and Roman periods is lower than those of Late Antiquity, the Roman Period amphorae, which constitute the focus of this study, were nevertheless identified in considerable numbers and with notable formal diversity. When the amphorae were evaluated typologically, it was determined that they originated from the Western Mediterranean, Aegean Region and islands Adriatic coast, Italy, Balkans and Cilicia Region. Based on

similar examples of their forms, the idea of which materials may have been transported is tabulated and it is understood that wine, olive oil and fish products were transported (Table 1).

It has been proved that Andriake, one of the most important stopping points of the ancient Mediterranean geography, became wealthy under Emperor Hadrian and continued to be so in Late Antiquity, both through archaeological materials such as amphorae, which are the biggest indicators of trade (including coins, various ceramic forms), and with epigraphic materials, including many goods in the annona system. In the light of all these data, it is understood that Andriake played a very important role in the Mediterranean trade, especially in the Lycian region, seen in the breadth of its hinterland, the size of its commercial network, and its social and economic impact.

As evaluated in the article, the most abundant forms are Dressel 2 and Kapitan II, while only one example was found from Forlimpopoli, Lamboglia II, Agora M 54 and Dressel 30. The only example of a stamp is found on the handle of the Dressel 30 form. The fact that it came from one of the important military provinces of North Africa shows in another way that Andriake was used for civilian and military trade. These amphorae originating from North Africa, Cilicia, Italy, Adriatic Coast, Balkans, Western Mediterranean, Aegean Region and Greek Islands prove that Andriake was a part of the trade with these areas.

Catalogue
Cat. No. 1: Form: Dressel 2-4, Area: Wine Processor, Diameter of Mouth: 12 cm, Height: 14.5 cm, Dough Description: Well fired, small pores in places, abundantly tempered with calcite, abundant sand and a little grit. Fabric Colour: 2.5 YR 5/8 (Red), Slip Colour: 2.5 YR 5/8 (Red), Date: 2nd-1st century AD.
Cat. No. 2: Form: Dressel 2-4, Area: Wine Workhouse, Diameter of Mouth: 8.8 cm, Height: 4.4 cm, Description: Well fired, small pores in places, abundantly tempered with calcite, abundant sand and small grit. Fabric Colour: 2.5 YR 5/8 (Red), Slip Colour: 2.5 YR 5/8 (Red), Date: 2nd-1st Century AD.
Cat. No. 3: Form: Lamboglia II Area: Wine Processor, Diameter of Mouth: 18.4 cm, Height: 14.4 cm, Description: Well fired, small pores in places, abundantly tempered with calcite, abundant sand and a few grit inclusions, Fabric Colour: 2.5 Y 8/3 (Pale Brown), Slip Colour: 2.5 YR 6/8 (Light Red), Comparison Examples: Ferreras et al., 2015: fig.7. Date: 2nd-1st century AD.
Cat. No. 4: Form: Forlimpopoli, Area: 2015 Workshop Excavation Waste Soil, Mouth Diameter: 8.5 cm, Height: 25 cm, Dough Description: Well fired, locally small pores, abundant and fine sand, abundant calcite, little mica and chamotte tempered, Fabric Colour: 7.5 YR 7/6 (Reddish Yellow), Slip Colour: 2.5 YR 6/8 (Light Red), Comparison Examples: Aldini, 1999: fig.5, Date: 2nd Century AD.

Cat. No. 5: Form: Kapitan II, Area: Wine Processor, Diameter of Mouth: 12 cm, Height: 28 cm, Crust Description: Well fired, small pores in places, abundantly tempered with calcite, abundant sand and small grit., Fabric Colour: 2.5 YR 5/8 (Red), Slip Colour: 2.5 YR 5/8 (Red), Comparison Examples: Voaker 2014: 40, fig.2,no5-6.Date: Mid 3rd century AD.

Cat. No. 6: Form: Kapitan II, Area: Wine Workshop, Bottom Diameter: 8.2 cm, Height: 10 cm Description: Well fired, locally small pores, abundantly tempered with calcite, abundant sand and small grit: 2.5 YR 5/8 (Red), Slip Colour: 2.5 YR 5/8 (Red) Date: Mid 3rd century AD.

Cat. No. 7: Form: Kapitan II, Area: Wine Workshop, Bottom Diameter: 12 cm, Height: 45 cm, Crust Description: Well fired, porous in places, abundant and fine sand, abundant and coarse calcite, little micaceous, Fabric Colour: 2.5 YR 5/8 (Red),Slip Colour: 2.5 YR 5/8 (Red) Date: Mid 3rd century AD.

Cat. No. 8: Form: Agora M 54, Area: WineWorkshop, Diameter of Mouth: 8 cm, Height: 15 cm Dough Description: Well fired, small pores in places, tempered with abundant and fine sand, abundant calcite, little mica and chamotte. Fabric Colour: 10 YR 8/3 (Very Pale Brown), Slip Colour: 10 YR 8/3 (Very Pale Brown), Comparison Examples: Şenol and Kerem 2000, Lev. 17, fig. 15, 94.7.1) Scale 1:10; Bezeczky, 2013, Pl. 12, 140, Pl. 51, 707; Majcherek, 2018, fig. 4, 27(Pseudo-Cos, 2nd century AD); Senol 2018, 491, fig. 414, 492, fig. 415. Date: 2nd c. AD.

Cat. No. 9: Form: Dressel 30, Area: Plakoma, Mouth Diameter: 13.9 cm, Height: 14.7 cm Dough Description: Well fired, locally small pores, abundant and fine sand, abundant calcite, little mica and chamotte tempered. Fabric Colour: 2.5 YR 6/8 (Light Red). Slip Colour: 2.5 Y 8/4 (Pale Yellow). Inscription: MAVRCAES TVBVS, Comparison Examples: Bonifay 2004: 15, no. 21-22, fig. 4. Date: 3rd century AD.

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Architecture and Society

Mosaic Villa I: Iasos

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Abstract

Mosaic Villa I is one of the most significant and spectacular examples of residential architecture of the Roman period in the Caria region, and it is one of the most prominent structures of the Ancient City of Iasos. The location of the building on the peninsula, its planning, and its decorations of mosaic and *fresco* are also important for providing analogical information for its period and geography. Comments made on the site so far consist of deductions about the functions of the rooms based particularly on the motifs on the mosaics and frescoes.

The geometric motifs used on the mosaics are part of a tradition that developed from 'black and white' style of the 1st century AD in Italy and continued with other colours. This style was also popular in the peripheral regions of the Empire. Today, we have come to know that matt colours are also used occasionally. We observe that red and green colours are used sparingly in the rooms and corridors of Mosaic Villa I of Iasos. The floor mosaics of the corridor, which were added after the construction of the main structure, are quite significant as they contain a hunting scene. The hunting scene on the corridor of Mosaic Villa I of Iasos is one of the outstanding examples of this tradition in Western Anatolia.



Figure 1. General view of Mosaic Villa I in Iasos (Photo by archives of the Iasos Excavation).

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Mosaic Villa I

Mosaic Villa I is one of the most significant and spectacular examples of residential architecture of the Roman period in the Caria region, and it is one of the most prominent structures of the ancient city of Iasos. The structure was discovered in 1968, and excavations were carried out by D. Levi between 1970 and 1971 (Levi 1972). Mosaic Villa I is located at a distance to the ancient city centre on a terrace on the slopes to the southeast of the peninsula where the ancient city is located (Figure 1). The location of the building on the peninsula, its planning, and its decorations of mosaic and fresco are also important for providing analogical information for its period and geography. A peristyle and a large peristyle constitute the centre of the house, from which four interconnected rooms open, decorated with frescoes and mosaics; in the west are parts added later, behind the decorated spaces, including a workshop, possibly serving for olive oil production, to the north. The earliest period in terms of architecture is represented by the remains of a large corner wall found in the southwest corner of room 5 in Mosaic Villa I.

Limestone and isodomic blocks were used as the construction material of this wall. Excavations carried out during the 2003 season in rooms no. 5 and 11 allowed the foundations of the walls to be located. The aim of our study is to evaluate the building in relation to the ancient city plan including its characteristics such as location, planning, mosaics, and frescoes, and other architectural elements. A north-south oriented plan, which is traditional in Greek and Roman residential architecture (Vitruvius 6. 1-7), was applied in Mosaic Villa I of Iasos, since the topography of the land is also suitable.

Comments made on the site so far consist of deductions about the functions of the rooms based particularly on the motifs on the mosaics and frescoes. The geometric motifs used on the mosaics are part of a tradition that developed from 'black and white' style of the 1st century AD in Italy and continued with other colours. This style was also popular in the peripheral regions of the Empire. Today, we come to know that matt colours are also used occasionally. We observe that red and green colours are used sparingly in the rooms and corridors of Mosaic Villa I of Iasos. The floor mosaics of the corridor which is added after the construction of the main structure are quite significant as they contain a hunting scene. We know that hunting scenes became popular and repeated between the second half of the 2nd century AD and the second half of the 3rd century AD. The hunting scene on the corridor of Mosaic Villa I of Iasos is one of the outstanding examples of this tradition in Western Anatolia.

As a result of our studies, we have confirmed that the depiction belongs to a dog which was identified as a leopard in previous publications. When we attempt to place the depictions in accordance with the measurements of the corridor, it is deduced that there must be at least one animal figure in the front part of the stairs. Along with the corridor, another section used as an olive oil workshop was added to the building in the north after the main construction. Apart from the western wall of the building, there are also spaces with vaulted tops whose functions have not yet been identified.

Courtyard with Peristyle

The peristyle courtyard of Mosaic Villa I is remarkable for its mosaic floors with geometric motifs covered with marble tablets (*opus sectile*). Traces of this covering is recognized from the remaining

mortar to date. Widely and fondly used in villas during the Roman Period, this type of flooring was an indicator of wealth and prestige. The floors of the porticos on the three sides of this area are covered - except for the north side - with two-colour (black and white) mosaics decorated with intertwined octagonal geometric shapes. The geometrically decorated area is enclosed in a black striped frame. Black and white *tesserae* were used for these floor mosaics (Figure 2).



Figure 2. Peristyle (Photo by archives of the Iasos Excavation).

Room No. 1 (Pastas)

The mosaic decoration used on the floor of the pastas, which is a hall that provides access to the rectangular shaped rooms on the northern side, consists of three square-shaped panels with rectangular spaces between them. All three panels are decorated with different geometric shapes. Between the square panels is a checkerboard-type motif in the centre with a thin long strip with ivy leaves embroidered at the ends. The four sides of this checkerboard and ivy motif are filled with semicircles - three on the long sides and two on the short - with diameters matching the sides of the square panels. This area at the centre resembles a carpet and is surrounded by a border with dolphin figures alternating with square panels (Figure 3).



Figure 3. Room No. 1 (*Pastas*)
(Photo by archives of the Iasos Excavation).



Figure 4. Room No. 2
(Photo by archives of the Iasos Excavation).

Room No. 2

The entrance of the room located in the northeast of the building is on the south side and has a wider opening in comparison to the other entrances. There are multiple phases of the building, and during the first phase, there was another entrance that provided access to Room No. 3 and was probably fitted with a mobile door - a functionality possibly based on the usage of the room - which was filled in in other phases when the entrance and exit to the space was provided via the aforementioned single door at the south side. Room No. 2 has a decorative area consisting of three parts (Figure 4).

In the rectangular area between the two square panels, a remarkable single handled jug (*oinochoe*) is depicted symmetrically on each side of a *kantharos* – a wide-mouthed drinking vessel. On the square panel above this section, triangular shapes form the first border with their base lines resting on the outer frame. Observing the traces on the mortar, it is deduced that 12 pieces of heart-shaped inner leaves as well as pointed, larger petals were crafted on the centre of the panel. A border with a simple weave motif (*guilloche*) - one widely depicted in ancient mosaics - surrounds the centre (Pataci 2019: 303-23). Ivy leaves are embroidered over the spaces on the bottom corners, with branches extending in two directions. A very small part of this panel has survived to the present day.

The figures specifically selected here will likely reflect the function of the room. Rooms where *kantharoi*, beverage containers, and similar ceramic vessels are depicted generally are used as *triclinia* where food and beverage services are prepared (Brothers 1996: 39-43).

Room No. 3

Like Room No. 2, the floor is divided into two separate square panels in which decorations are crafted with two rhombuses in the rectangular space between the panels (Figure 5). The upper panel is filled with six-leaf rosettes repeating as a circle starting from the centre. A border of tongue motifs is observed here enclosing the section where the tongue motifs constructing the border are separated by black thin bands. Four black shields (*peltae*) are depicted at the corners. The corners of the area inside the lower panel contain sophisticated circle motifs and small rosettes with black *tesserae*.



Figure 5. Room No. 3 (Photo by archives of the Iasos Excavation).

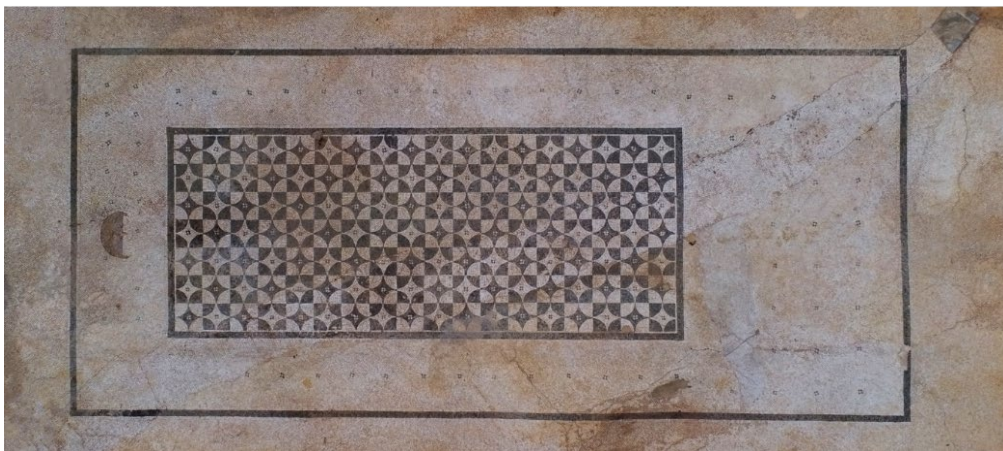


Figure 6. Room No. 4 (Photo by archives of the Iasos Excavation).

Room No. 4

In contrast to the other rooms, a simpler decoration was preferred in this space. A single, rectangular panel was created using black and white *tesserae*. The inside of this rectangular panel is divided into squares in which small black rosettes are depicted at the centres in a formation of rhombuses of different colours. A single shield (*peltae*) with red *tesserae* was placed facing the entrance door, again in silhouette style, almost to emphasize the entrance (Figure 6). This panel is also enclosed in a black frame.

Room No. 5

This room's mosaic floor stands out as featuring the most striking and sophisticated motifs of the villa. A composition consisting of three square panels placed adjacently. A meander motif is applied inside the upper and lower panels. These boards are almost planned as the photographic negative of each other, where three colours of *tesserae* were used: white, black, and red. The square panel in the middle has a heart-shaped, four-leaf rosette in its centre within a rhombus made of red *tesserae*, and this central composition is again enclosed in a strip of a check-board pattern. This motif is crafted in a rose-style, creating an optical illusion. Ivy leaves made of white *tesserae* are placed in the corners with branches extending both sides, as in the upper panel of Room No. 2 (Figure 7). The room on the northwest side of the villa is the largest and carries the most complex and elaborate of auxiliary decorative elements, i.e. frescoes and mosaics. In the south, there are smaller spaces that we suggest are the *Latrina* and the bathroom, leading us to believe this must be the bedroom (*cubiculum*).



Figure 7. Room No. 5 (Photo by archives of the Iasos Excavation).

Corridor

A five-step staircase in the south leads up to the entrance to the villa. The living areas are accessed via a corridor almost 25m long from the stairs. Most likely, these parts of the building - the entrance and the corridor - must have been added during a later period. And some possible changes were made in this area -possibly some walls added - during the Late Antique age. The deterioration of the *tesserae* on

the corridor floor is intense, due to these interventions. Here, on a white background, a bear, a wild ass, and a dog (Figure 8) are chasing one another. Angiolillo and Pilo earlier published the figure in front of the wild ass as a leopard (Angiolillo and Pilo 2014: 11-24). However, during the excavation season of 2021, this figure has been identified, in certainty, as a dog.

The bear figure depicted as a black silhouette is running towards the entrance of the villa. It has a short tail, convex neck, open jaw, hexagonal white eyes with black pupils, and is in an elevated position standing on its hind legs. The front legs are spread, and the hind legs are resting on the frame of the mosaic panel. Black and greyish blue are used to colour the wild ass with a black head, ears, upper back, tail, hind legs, hoof of the leading foreleg, and the inside of the knee of the leading hind leg. While there are likely some missing pieces, the original composition must have consisted of a series of animals chasing their prey: the bear is chasing a wild donkey while the dog is possibly chasing another animal (Figure 9, left).



Figure 8. The bear, on the right, chasing the wild ass, on the left from the corridor in Mosaic Villa I (Photo by archives of the Iasos Excavation).

During the studies carried out in 2021, the figures on the floor mosaics of the corridor were partially revealed. The hind legs of another animal (wild goat?) being chased by the dog were observed, but the species could not be identified (Figure 9, right). This floor is the only example where a familiar subject is depicted in Mosaic Villa I; other floors contain geometrical figures except a few exceptions as described earlier (*peltae*, dolphin, *kantharos*, *oinochoe*, crater, and branches and leaves of ivy, etc.). As for the silhouetted animals in this corridor, all of these animal parts except the dog are made in black. The black parts are the backs and necks, hind and front legs, inside of the forelegs, and tails.

We propose that there are four animal figures running to the left on the right and one animal figure running to the right on the left, in this corridor composition. The bear, the wild ass, and the dog figures

can clearly be identified today. Only the hind legs can be observed of two figures, which are expected to stand opposite each other in the centre. On the floor of the stairwell, there is a black floor with small rosettes scattered in parts. The Mosaics at Iasos are dated to the period between the end of the 2nd century AD and the middle of the 3rd century AD, and it would probably be correct to accept the mid-3rd century AD as the *terminus post quem* for Mosaic Villa I of Iasos.



Figure 9. Mosaic of the dog, on the left, and of perhaps a wild goat, on the right from corridor of Villa
(Photos by archives of the Iasos Excavation).

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Housing in the Iron Age Mediterranean from the Levant to Sicily

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Abstract

The way people and communities built and conceive their houses says much about their lifestyle and social organization. As the smallest nucleus of the social structure, houses and their layouts reflect the cultural patterns and self-perception of a community. When Phoenicians in the 9th century BC moved from the Levant and settled colonies all over the coasts of Mediterranean, they brought with them their idea of living space and their architectural and building skills.

This paper aim at framing the study of the Phoenician domestic architecture in the Mediterranean focusing on two main questions: How the Phoenicians preserved their way of dwelling by adapting to the different landscapes and environments of the Mediterranean? How the local populations readapted their architectural models, enrooted in the Bronze Age Mediterranean tradition, after the encounter with the Levantine housing conception and different architectural techniques?

With this in mind, an architectural comparison is presented between some case studies comprising Levantine and Sicilian indigenous houses, in the period between the 11th and then the 8-6th centuries BC: this will provide the cue to trace continuities, changes and mutual influences in the construction of a new idea of house, shared between Phoenician colonisers and the Sicilian indigenous population settled in the same territory.

Introduction

The purpose of this article is to examine the transformations in Mediterranean societies during the Iron Age, in contexts of intensified cultural and commercial exchanges, with a particular focus on Western Sicily between the 8th and 6th centuries BC. It explores how communities redefined their perceptions of other cultures and social groups, leading both to the creation of a shared language and the exchange of habits and material culture, and to the rediscovery of differences and local particularities. These dynamics reinforced community identities and generated boundaries - sometimes even territorial - through processes of comparison and contrast with others.² These phenomena are reflected in everyday practices and habits, which we investigate through a detailed analysis of domestic spaces. Houses, acting as a magnifying glass on daily life, constitute a crucial element of material culture, offering a

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² This concept has been analysed in the context of Iron Age Sicily by T. Hodos (2010: 81-3) in a study on globalization, understood as a process that reinforces and highlights heterogeneities and expressions of identity.

unique lens for studying historical dynamics. Their analysis provides insights into the daily lives, social interactions, and cultural identities of past societies - in this case, the Phoenicians and Indigenous peoples of Western Sicily during the Iron Age (late 9th-6th centuries BC).

Within this historical framework, our study focuses on the development and changes in domestic layouts, comparing aspects of daily life between the Phoenicians and the local communities present at the time of their arrival. Through this analysis, the article aims to highlight both changes and continuities in dynamics that concern not only the family and domestic spheres but also broader social structures. This approach rests on the premise that the house mirrors, on a smaller scale, the social organization of the community, both in its spatial arrangement and in the activities conducted within it, as evidenced by the distribution and quantity of materials.³

When Phoenician's seafarers settled in Western Sicily to establish new trading outposts, they brought with them their own architectonic traditions and building techniques that suited their needs and lifestyles. In that period, the end of the 9th and all the 8th centuries BC, Western Sicily was inhabited by indigenous communities culturally linked to the Late Bronze Age Sicilian tradition, also speaking for the architectonical one. Following, some cases studies of domestic structures of both Phoenicians and indigenous people in Iron Age Sicily will be presented. It will be clear as the Phoenicians basically maintained their own way of building houses, although they sometimes modified the layout from the Levantine traditional one, for different reasons: to respond to better adaptation strategies to the territory, to satisfy needs arising from the intense trading activities, such as increasing the number of storage rooms strictly connected to the domestic and private ones.

This frame changes a lot if we look at the developments occurred along indigenous houses in this period. In fact, we generally assist to a radical change in domestic architecture and layouts, with the introduction of rectangular juxtaposed rooms destined to specific activities. Nevertheless, some features and materials as the local made pottery, installations such as ovens or cooking plates or the domestic cultic and ritual sphere still seem to recall the tradition-rooted Bronze Age's ones. We will see such as these changes occur as an autochthonous response to deal with the new reality, which included the establishment in Sicily of foreign people as the Phoenicians and, starting from the 8th century BC, also the Greeks. It seems that indigenous people welcomed and had relations with the newcomers in their villages and houses, by providing new zones separated from the private ones and intended to host meetings with foreigners. This frame can be seen not only at a domestic architecture level, but also through material culture, such as pottery.⁴

³ For a deeper exploration of the theories of Household Archaeology, see, among the first, (Yanagisako 1979; Wilk and Rathje 1982; Carsten and Hugh Jones 1995). More recent works include (Nevett 2010; Müller 2015).

⁴ It is clear in the case of the Monte Polizzo House 1, where local pottery, marker of the persistence of practices, was used for domestic and intimate purposes, while Phoenician and Greek fine vessels were found in a different area of the house, used for banqueting and meetings.

Among this particular historical framework concerning Western Sicily in the Iron Age, a focus on the development and changes in houses layouts and a comparison between aspects of daily life could reveal important dynamics concerning not only the familiar and the domestic sphere, but also the social one, as the house reflects, at a small scale, the social structure of the community, both in its spatial organization and for the activities carried out inside, testified by the distribution and quantity of materials. Below are some cases that will show all these features, starting from the two main type of Levantine Iron Age's houses, and then by describing western-Sicilian houses built and inhabited by Levantine and indigenous people.⁵

The Levantine House in the Iron Age

Two different types of houses' layouts are documented in the Iron Ages' Levant. One is the so-called *Caananite Courtyard House*, that seems to be the most ancient one, dating to the Iron Age I (12th-10th centuries BC), although it appears for the first time in the Late Bronze Age (14th-13th centuries BC).⁶ It consists of a house with a courtyard as its central core and many rooms arranged around it. Some of the most representative cases are the 00-k-10 building from Megiddo stratum k-4⁷ (Iron Age IB – 11th-10th century BC) and the so-called *Hashtag House* at Tel Dor, that present four construction phases from Iron Age IA to IIA (Phases G/9 - G/6) (Gilboa *et al.* 2014: 39-80). This type of houses was usually inhabited by a household, intended as a productive and often self-sufficient familiar unit, as suggested by the many storage jars, cooking and preparation ware and food processing tools founded inside them. The layout of the *Canaanite Courtyard houses* also included a distinction between intimate areas devoted to feasting, such as the second-floor rooms in the house of Tel Dor⁸, and other areas used by the entire family for daily tasks, as the courtyard and the rooms around it, such as storage rooms for harvesting products.

The 00-k-10 building at Megiddo apparently lacked a second floor, but it also included some private rooms with no direct access from the courtyard and other most accessible areas, as the kitchen with a hearth, a storage room and others used for multifunctional purposes as food processing and weaving activities (Figure 1). Despite their size and layout complexity, it seems that these houses were not

⁵ This paper is intended as a preliminary study; therefore, it lacks substantial numerical data and does not comprehend all the current evidence of domestic houses of the periods and areas selected, since the study is part of an ongoing PhD research that will hopefully guarantee the collection of all the available cases studies.

⁶ Considering the scarce remains of domestic architecture in the Phoenician coastal sites, subject of this study are also some cases that are not in proper Phoenicia but considered part of the same Canaanite cultural sphere.

⁷ Comprehensive studies of the Iron Age's Building in the city of Megiddo are presented by Y. Gadot and A. Yasur-Landau in the excavation's campaigns report Megiddo IV (2006), conducted from 1998 and 2002. For a deep analysis on the function of the houses' rooms see also (Shahack-Grass *et al.* 2009: 172).

⁸ These rooms contained lot of fine drinking vessels probably used in banqueting occasions (Gilboa *et al.* 2014: 58-61, 65).

inhabited by an elite but by an enlarged family. Moreover, the striking presence of many storage vessels and rooms could suggest the self-sufficiency of the household and the consequent lack of a central power controlling this activity in Tel Dor and Megiddo, at least not during the Iron Age I (Gadot and Yasur-Landau 2006: 574).

The other typical Levantine house of the Iron Age is the so-called *Four Room House*, consisting of three parallel elongated rooms and a broad room flanking them on the long side (Figure 1). Although the first examples also come from the Late Bronze Age (Braemer 1982: 220-3), this house had an enormous fortune and diffusion during the Iron Age II, probably due to the reduced number of rooms and the lack of an internal courtyard, important features for the densely urbanised and fortified settlement arising with the emergence of the new statal complexes of the Iron Age II in the Levant (10th-7th centuries BC). Its structure, in fact, allowed to share walls with adjoining houses and with the casemate rooms of the fortifications' wall enclosing the citadel, as well as to use the flat roof for daily tasks, as if it was a courtyard. Inside the *Four Room Houses* of Iron age II (10th-7th centuries BC) fortified settlements of the Levant, as Tel Beersheba, there was not any space for storage, which was administered by a central power in specific buildings consisting of three long parallel rooms (Singer-Avitz 2011: 278-81). These two different layouts just presented probably reflected, in these cases, a different organization of the familiar unit and the community: the Canaanite Courtyard houses suited the need of self-sufficient families living in a society without a central power controlling food production and storage. Instead, the *Four Room Houses* at Tel Beersheba were inhabited by nuclear families depending on outer sources for their sustenance. It should be noted, however, that this framework is not straightforward all over the Levant and that similar house types can encounter different ways of use: in fact, the *Four Room House* layout had a big fortune and became widespread in the Levant both in time and space, so there were also cases where this type of dwelling was used in villages or in the countryside, and were often adjoined by an outdoor courtyard shared with a next-door house, inhabited by a related family (Braemer 1982: 49-50).

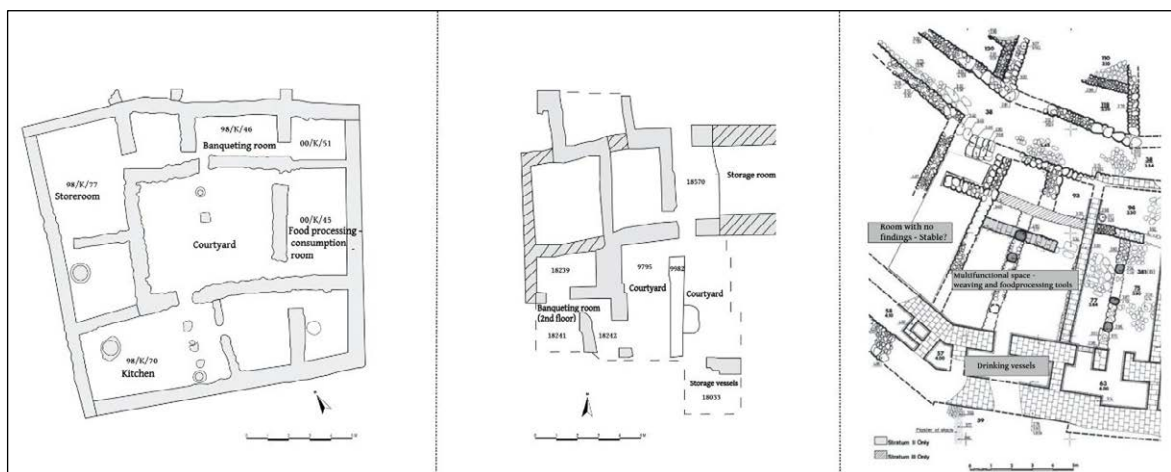


Figure 1. From the left: Canaanite Courtyard houses of Megiddo and Tel Dor and a Four Room House from Tel Beersheba (9th century BC) with indication of the activities based on findings (After Yasur-Landau 2006: 565; Gilboa *et al.* 2014: 44; Singer-Avitz 2011: 283).

The Phoenician House in Sicily

An example of Phoenician house in the Mediterranean is the so-called Building C8 (800-675; 675-550 BC) in the little island of Motya in western Sicily. Primarily intended as a storehouse for trading goods, it was very likely also used for domestic purposes. In its layout, in fact, the typical structure of Levantine storehouses, composed of three parallel elongated rooms, was joined to an area comprehending a courtyard rounded by rooms used for domestic activities (Figure 2). Built with mudbricks on a stone blocks' foundation, the building had a rectangular shape, and it was 234 sqm wide. The entrance, located in the south-west part of the building, led to a vestibule that opened to the north on the storerooms, to the eastern wing on the courtyard and its enclosed rooms and to the west on a small, pillared room and a stairwell, thus suggesting the presence of a second floor.

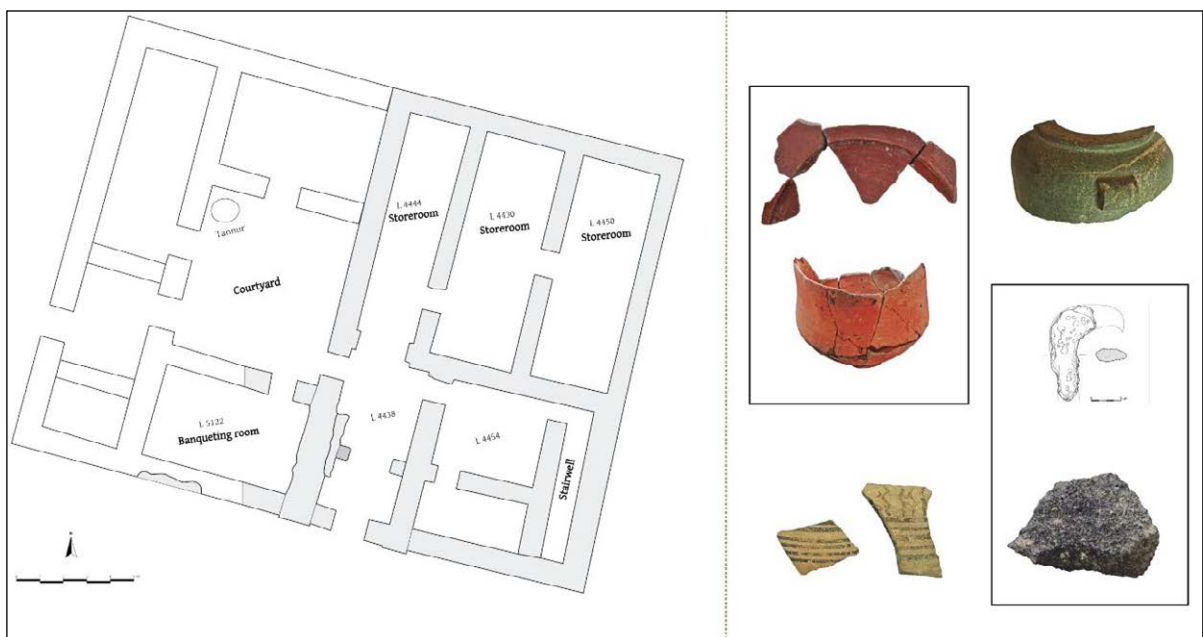


Figure 2. Building C8 and some findings: Phoenician Red Slip plate and chalice (800-750 BC); fragments of an indigenous painted jug (8th century BC); an Egyptian Old-Kingdom serpentinite vase; an iron sickle and a basalt grinding stone (After Nigro and Spagnoli 2017: Figs. 22, 3, 16, 34, 35, 40).

The materials found in the various rooms were abundant and diversified. Inside the three elongated rooms many transport amphoras and pithoi were found, as well as 'exotic' goods as an Egyptian serpentine vase and a calcite alabastron, thus confirming a use as storerooms. Some basalt grinding stones, an iron sickle used in agriculture as well as impasto cooking ware (Nigro and Spagnoli 2017: 10-33) were found in the courtyard. This may be indicative of a domestic use of this area for food and harvest products processing; this use is also suggested by the presence of an ashy lens left by an oven. In the entrance and the vestibule area there were some fishing and navigation tools, as stone ballasts, iron hooks and net weights. Finally, many fragments of Phoenician Red Slip fine vessels were found in one of the rooms around the courtyard, together with a fragment of an Elymian painted jug, decorated

with bands and wavy motifs (Figure 2, L5122). This important evidence testifies relations with local people: it is very likely that these vessels were used in feasting occasions that took place in this area of the building. It seems clear that the principal meaning of this building was storage of trading goods, that Phoenicians exchanged with local people but also preserved in Motya in order to continue the travel to other outposts of the west Mediterranean. Nevertheless, the presence of domestic tools and evidence of food processing and feasting activities, reveal a domestic use of this structure by people dedicated to trade but also to agriculture and fishing for self-sustaining. This structure is the only one known at Motya dating to the 8th-7th centuries BC, together with the temples in the areas of the Kothon and the Cappiddazzu. From the excavations carried out in the 90's by Antonia Ciasca and Maria Luisa Famà (2002: 17-34), it seems that there were other archaic domestic structures dating to the 7th century located in area B, not far from Building C8. However, they were not fully investigated and cannot enrich, at the current state, our knowledge about archaic houses at Motya.

The Sicilian Indigenous House

Some of the most representative domestic structures in Iron Age Western Sicily are the ones discovered inland in the countryside at the sites of Monte Polizo and Monte Maranfusa (7th-6th centuries BC), in territories inhabited by indigenous people, respectively the Elymians and the Sicans.⁹ Evidence from other western-Sicilian sites dating to the 7th century BC show different housing solutions, still strongly linked to the Late Bronze Age architectonical tradition: monocellular circular huts with stones foundation, such in the cases of Polizzello, Montagnoli and Monte Castellazzo di Poggioreale (Albanese Procelli 2009: 351-2, Fig. 4; Spatafora 2009: 370). With the beginning of the 6th century BC, these same settlements show the adoption of rectilinear architectures, with the construction of monocellular rectangular dwellings with an elongated layout, including benches along the long walls, as in the case of Sabucina and Scirinda di Ribera (Mollo Mezzena 1993; Castellana 1990: Pl. XLVIII; Tusa 1952: 659-61). It has been proposed for this type of dwelling a connection with housing solutions adopted by Ausonian populations - originating from the Italian peninsula and carrying a continental culture - which settled in Sicily already in the final steps of the Late Bronze Age (Albanese Procelli 2009: 353). However, the articulated spatial organization of the dwellings of Monte Polizo and Monte Maranfusa suggest a different story and developments occurred in these other settlements.

The House 1 at Monte Polizo

Monte Polizo was located on a hilltop overlooking the sea on the west side, and it was surrounded by a woody countryside all around. During the 7th century BC, the settlement developed, and several

⁹ Traditionally, the Elymians inhabited the most western part of Sicily, while the Sicans the western-central area of the island (Tucidide 6. 2, 1-5). For their origins and history see, among others (Tusa and Vento 1989; Albanese Procelli 2003; D'Asaro 2009).

buildings were constructed, such as the ones located in the central area, House 1, 2 and 3. House 1 (625-550 BC) is the most ancient and extended one (150-200sqm), built on an artificial flat ground with stone blocks foundation in support of wattle and daub walls and probably a straw roof.¹⁰ It had a rectangular shape and presented two larger rooms opened towards south, on the street (I, II), flanked by four smaller ones on the north-west (III, IV, V, VI), two of them accessible from room I and the other two from room II (Figure 3).

Room I was probably semi-covered and used as a multi-purpose space. It contained a heart made of local impasto and a stone rounded platform in the north-west corner, above which twenty clay loom weights were discovered (Prescott and Mühlenbock 2013: 225). The room preserved several pottery fragments, cooking ware in the hearth zone, and several imported fine Greek vessels¹¹ on the northern part. The other large room (II), in connection with the smaller room V, contained local made pottery, particularly Gray Ware bowls, some of them with incised or impressed decorations, and some jars, as well as a Phoenician and some Corinthian and Etruscan transport jars (Mühlenbock 2013: 91, Fig. 38). A favissa was discovered in room VI, the less accessible one. It was probably ritually closed for the presence of burned bones, and inside there were exceptional items, such a bronze bowl, an attic cup, a locally made anthropomorphic drinking cup or *capeduncola* (Mühlenbock 2008: 110, Fig. 51) (Figure 3).

This house appears as divided into two zones, and it had a restricted accessibility. For the heterogeneous materials and the presence of imported fine vessels, it is very likely that room I was used by the family for daily tasks, such cooking, food processing and weaving, but also in feasting moments in particular occasions linked to wine consumption. On the other hand, room II, together with its annexed small rooms, had a most intimate and private vocation, as testified by the presence of local produced items. In this area of the house was room VI, which, given the presence of containers for storing wheat, the favissa with particular objects, and traces of ritual activity, may have been used for domestic cultic practices, possibly linked to the preservation of cereals. It has been suggested that the shape and size of the *capeduncola* indicate its use in measuring portions of wheat for daily cooking. This interpretation rests on the hypothesis that the vessel had a practical, everyday function related to food preparation, which may have been consecrated through ritual actions due to the uniqueness of its decoration.¹²

The most considerable feature of House 1 is the construction of the structure on an artificially flattened ground, its huge dimension, the complex articulation of the rooms and the clear division between most

¹⁰ The artificial flat ground, the thatched roof, the wattle and daub walls and the floor dug into the bedrock, are common features to some Late Bronze Age site in western Sicily, like Mokarta, where round huts were built on flat terrains (Mühlenbock 2008; Prescott and Mühlenbock 2013: 66-70; Nicoletti and Tusa 2000). This reveals at Monte Polizo a strong link with the local architectonical traditions.

¹¹ Ionic cups were the most represented group of fine vessels imports, related to wine drinking (Mühlenbock 2008: 93-7).

¹² This hypothesis of a type of female domestic ritual linked to the agrarian world and, specifically, to wheat and cereals has been proposed by M. Ferrer in the case of House 1 at Monte Polizo (Ferrer 2021: 41).

intimate zones dedicated to daily and domestic activities and other areas with a more public vocation, probably opened to external people, occasionally used for feasting.

Houses 2 and 3 were built making use of the natural rocky steep slopes of the hilltop for foundations and some of the walls.¹³ They were not part of the same project of House 1, because of the different spatial organization and alignment: these houses are considerably smaller and are located on the other side of the street, turning their back against House 1. They were probably built for further necessities of the growing settlement. Among these houses several small flat hotplates were discovered, some of them decorated with incisions, confrontable with similar items from the 8th century BC site of Montagnoli, not far from Monte Polizo (Castellana 2000: 275, Pl. 37).

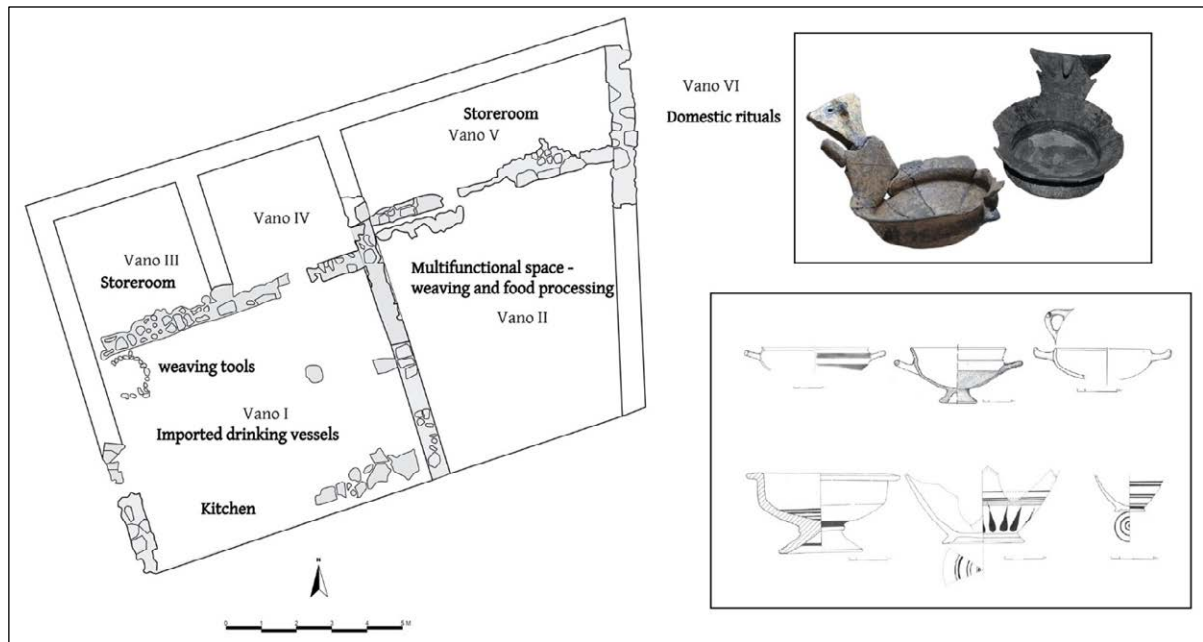


Figure 3. House 1 layout and use of spaces with some representative findings. From the upper left: Elymian capeduncola found in room VI; imported Greek vessels, such as Ionic and Calcidian cups, Corinthian *kotylai* from room I (After Prescott and Mühlenbock 2013: 225; Mühlenbock 2008: Fig. 39).

Buldings 1 and 2 of Monte Maranfusa

The site of Monte Maranfusa, located on a high plateau in the western-central area of Sicily, was surrounded by the fertile Belice valley and it was connected both with the Tyrrhenian coastal sites around the area of Palermo and Solunto, and with that on the south-west coast of the island. The site was occupied since the Bronze Age, although the first evidence of structures date to the 8th century BC, becoming more consistent in the 7th and 6th centuries BC with the construction of the dwelling

¹³ This kind of technique is used in Sicily since the Late Bronze Age, see, as an example, huts 2 and 5 discovered at the Erbe Bianche settlement (Ingoglia *et al.* 2012: 862).

quarters. The settlement developed on the northern slopes of the hilltop and above the acropolis and was abandoned during the 5th century BC.

Buildings (*Edifici*) 1 and 2 are two domestic structures dating to different phases of the site: the former was constructed in the 7th century, while the latter should refer to a phase of redefinition of the settlement in the 6th century. Both houses were constructed using the same building techniques: the drystone foundations leant directly on the bedrock and the natural marl soil, while the dual-face walls were made of daub filled with pebbles. The roofs were made of wood and straw. Building 1 consists of three juxtaposed rooms (A, B, C), it extended for 40sqm and it had a NS orientation. The central room B was the only one opening towards the west on a communitarian courtyard - shared with other houses overlooking it - and towards the north to room A, while the other two rooms were connected to each other to the west by a paved narrow backyard (Figure 4).

Every room of the building contained installations as well as many pottery items: inside room A there were two squared slabs fixed on the ground, interpreted as delimitations for a bedding (Spatafora 2003: 37)¹⁴, and a series of vertical slabs in the south corner rounded by an ashy lens. Inside the room there were also many local made vessels with painted or incised decorations. On the south wall of room B there were a stone bench intended to lean three imported transport jars, of which one was Punic and another of western-Greek production. In room C there were an ovoid platform used for pressing and milling of cereals, found together with an indigenous (local made) crater with a painted geometrical decoration (Figure 4).

Therefore, it seems that this house disposed of areas for specific activities: Rooms A and C, not directly accessible from the main courtyard, had a most private vocation; in particular, room A was probably a resting room, while room C was used for food processing. Room B, the only one accessible from the eastern courtyard, was used as a little storeroom for food commodities and as an intermediate space that connected the house with the rest of the community and the external world, as symbolised by the presence of imported jars. The disposition of the rooms in clusters recalls the Bronze Age Sicilian architectonical traditions, meanwhile the specific spatial organization and the presence of a backyard, could be discerned as innovations. The eastern courtyard should have been an area shared by the community - at least by other houses that opened on it -, used for consumption or feasting as well as for cooking and food processing activities, as testified by local made bowls, some of them with painted decorations, and for the presence of a big fireplace framed by a stone circle.

Building 2 is representative of the architectonical innovations occurred at Monte Maranfusa in the 6th century BC, when the settlement underwent through a redefinition resulting from a single project: new dwellings were built, and they were still linked to tradition as concerns building techniques and the internal articulation of the room but displayed innovative layouts. Building 2 (135sqm) consisted of five

¹⁴ For a complete understanding of the stratigraphy, materials and complexity of the site see (Spatafora 2003).

rooms (D, E, F, H, Q) disposed in a longitudinal axis, connected to each other, and opened towards the north to a long courtyard alongside the facade of the house (Figure 4).

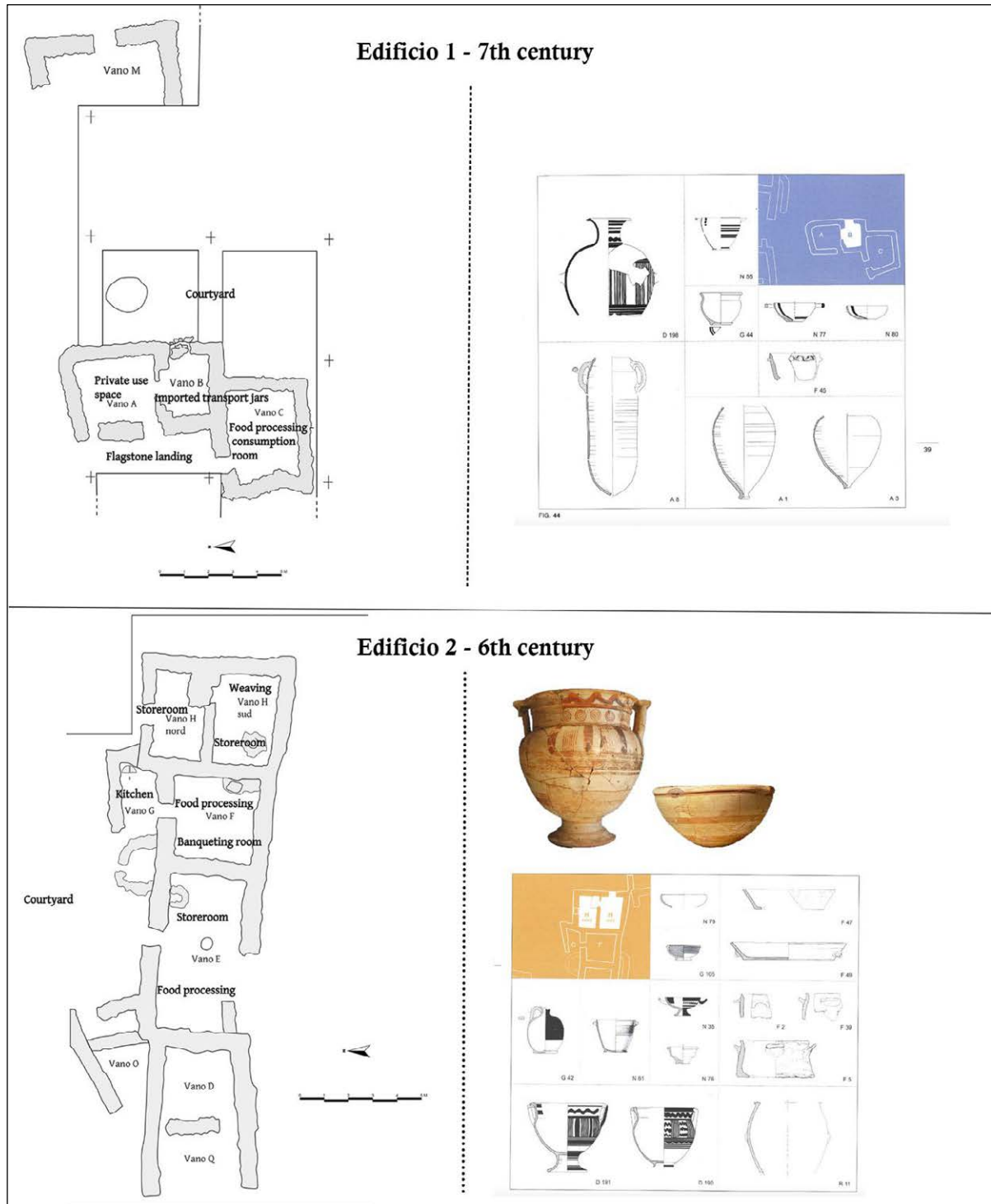


Figure 4. Building 1 and 2 at Monte Maranfusa and some characteristic vessels: indigenous kraters, hydria and basin with painted geometric decorations, a Punic amphora, local handmade pottery (After Spatafora 2003: Figs. 34, 49, 44, 67, 76, 288).

The rooms had the same size, a part for the central one, room E, bigger than the others. This latter functioned as storeroom and food processing area, for the presence of storage jars, a large pithos and a support made of small stones that sustained a basin used for food processing. To the east, room F had probably the function food processing and consumption room. This is suggested not just by the many fine ware indigenous and imported pottery, as bowls, jugs, *kylikes* and *kraters*, or for the grindstone, large bowls and basins found in it, but also for the functional connection with the adjoining room G, interpreted as a kitchen for the discovery of a clay hotplate. This latter represents an extraordinary piece: it is a circular hotplate divided into four slides, attested in Sicily since the Middle Bronze Age, that testify a strong continuity with the prehistoric western-Sicilian cooking traditions (Nicoletti and Tusa 2012: Fig. 7.13; Spatafora 2003: 43-54).

Lastly, room H was divided in two parts by a partition wall and contained, in the most hidden part, many loom weights as well as two painted indigenous *kraters*, while two pithoi were founded on the side opened toward the courtyard. It is possible that this room was intended to contain not daily furnishings and used also for weaving activities in the most intimate part. Room D and Q were not well preserved, and only few loom weights and a pithos were found in there. For this reason, it has been proposed for them the same function of room H, suggesting that the building was inhabited by two domestic units that shared the central storeroom, kitchen, and consumption room.¹⁵

Discussion

As an intent to outline the variegated frame of domestic architectures in Iron Age western Sicily, this contribution reinforces data and perceptions expressed previously among the scientific scenario and tries to enrich the research by lighten up some daily life patterns and characteristics reflected on house's layouts and material culture. First, as concerns space articulation, in almost every case shown, it can be noticed the presence of a courtyard as the core of the house: in Levantine and Phoenician houses they were in a central position, had a multi-purpose function for daily life tasks, and served as connection areas to access other rooms. The same function had courtyards in indigenous houses, but they were adjoined to one side of the house, with rooms opening towards it. This latter model has been documented in Building 2 from the 6th century BC at Monte Maranfusa, and it features a layout that notably resembles the Greek *pastas* houses, attested in Magna Graecia Sicily since the 7th century BC.¹⁶

Storerooms constituted another important feature: their presence testifies a more or less high level of self-sufficiency of the domestic unit in the management of their goods. At Motya they were huge, and they also hosted trading goods, while in indigenous houses they generally served to sustain the family

¹⁵ For the analysis of Building 2 see (Spatafora 2003: 65-80; 2009: 272-3).

¹⁶ The term *pastas* refers to a transverse porch placed in front of the main rooms that serves as a hinge between them and the courtyard. For examples in Sicily, see, among others, (Greco 2018). For studies on domestic spaces in ancient Greece, see the works of L. Nevett (1999; 2023).

or, in certain cases, to store surplus food, as in the case of House 1, where many pithoi and storage pottery were found.

In general, starting from the 7th-6th centuries BC, a growing necessity to create a specialised internal articulation of rooms is visible alongside western Sicilian houses. This is translated into the creation of areas that could host new practices, such the feasting one, transposed from the colonial Greek and Phoenician reality, as we can see at Monte Polizo and Maranfusa, while during the Late Bronze age this kind of practices took place in communitarian areas inside the village and not inside houses. This particular data leads to further considerations: it seems that indigenous people, compared to the past, felt the need to deal with the new colonial reality established in the coastal areas of the island: that's why in their houses they included meeting areas that could host external people to the domestic unit, as foreigners, probably in banqueting occasions.¹⁷ These are testified by the many drinking vessels found: at Motya mostly represented by Red Slip and painted fine vessels, but also imported from the Greek realm; in indigenous sites they were imported, of Greek or Siceliot production, as ionic cups and Corinthian *skyphoi*¹⁸, or locally made, as the Gray Ware pottery with incised or impressed decorations at Monte Polizo or the geometric painted pottery of Monte Maranfusa.

These new practices also changed some circulation patterns in houses' layouts: in House 1 at Monte Polizo the two bigger front rooms are clearly more accessible and used for everyday activities and meeting ground, while the back rooms were more restricted and intimate, as also testified by the only presence of local made pottery. This kind of disposition suggests scarce control in terms of circulation of space inside the house (Spatafora 2003: 77; Mühlenbock 2008: 170).

At Monte Maranfusa, between the 7th and the 6th century could be discerned a similar pattern: Building 2, though, had a more restricted internal accessibility compared to House 1 at Monte Polizo, although the long courtyard alongside the house served as a link to connect every rooms. On the other side, despite these developments and innovations, there could be also discerned some conservative elements among indigenous houses. These testify the maintaining of daily life habits strictly linked to the local Bronze Age tradition, visible, among others, inside cooking areas: the presence of a four sliced hot pan in Building 2 at Monte Maranfusa represents a striking example of the maintaining of local cooking

¹⁷ For recent studies on banqueting in Iron Age Western Sicily see (Öhlinger 2021: 185-216; Ferrer 2016).

¹⁸ Among the indigenous inland sites, a huge quantity of imported Greek vessels, made in Greece or in Sicily, were found, while, on the other hand, there is a scarce presence of imported Phoenician vessels. This data does not mean that Phoenicians did not have relations with these realities and the lack of Phoenician pottery in these sites could be explained in other ways. From one side, Greek drinking vessels were popular in that time and had a wide diffusion in trading markets: at Motya we find many of them in the same period, probably indicating that Phoenicians too were involved in their trading, possibly with the indigenous inland sites (Mühlenbock 2008: 92-4). Moreover, it cannot be excluded that the pottery repertoires from Monte Polizo and Maranfusa could hide some Phoenician vessels yet to be seen, as suggested by the presence of the two Punic amphoras found at Monte Polizo.

traditions.¹⁹ Another area where the maintenance of local habits seems to be observed is, as we saw, in domestic religious rituals, in which indigenous vessels and material culture continue to be used, thus reflecting the preservation of local worship.

Conclusive Remarks

Define clearly if a structure of the past was intended as a house or not can be sometimes a hard task. The conception of house could have been different for ancient societies, although it has always probably meant a familiar place of intimacy, perceived as a haven and generate sense of pertinency to it, as the human being always felt the need to inhabit in general, temporary, or permanently.

One could say, though, that house is a place where people spend a great part of their daily life, carry out domestic activities and go to sleep, and that it's a structure defined by more or less physical boundaries, like walls. This is a good starting point; however, one must consider that in some societies these types of activities are often performed in collective and communitarian structures, or even in open air places. In any case, domestic spaces reflect social complexity and provide insight into how communities were organised. As noted earlier, they act as a lens through which the daily life of past societies can be examined²⁰, making them particularly valuable for detecting changes, continuities, or the persistence of traditions in historical periods and contact zones, such as the Mediterranean during the Iron Age. The term *globalization* has been used to describe the social and economic outcomes of increasing contact between different populations in this period. Importantly, this should not be understood as a process of homogenization, but rather as a force that highlights heterogeneities and identity issues, especially those made visible in material culture within mixed cultural contexts (Hodos 2010: 81).

Focusing on domestic life in selected Iron Age houses in Sicily (8th–6th centuries BC) allows us to trace transformations between Phoenician and indigenous communities by examining everyday practices. The arrival of foreigners - Phoenicians and Greeks - with a rich, multi-layered sociocultural background triggered rapid changes in Sicily, in contrast to the slower developments typical of the Bronze Age. The

¹⁹ In a recent study, Torres Gomariz (2022: 231-2) noticed the occurrence of a similar pattern in the development of some 4th century indigenous houses in the island of Majorca and Minorca, which in that period came under the Punic orbit. The maintenance of traditional cooking and preparation ways, and the introduction, on the other hand, of new feasting habits testified by imported drinking vessels or product from the Punic realm. In this sense it could be interesting to compare the 6th century indigenous communities of inland western Sicily to the 4th century Menorcan ones, for the similar responses they had to the strong Punic or - in the case of Sicily - Greek influence and for being located in a 'peripheric' position with respect of these forces, since they haven't been directly colonized (differently in the cases of Ibiza and Formentera or the coastal sites of western Sicily).

²⁰ For a discussion on the importance of adopting a focus on the archaeology of everyday life, see Robin (2020).

landscape evolved quickly, and new architectural forms and domestic habits introduced by these groups underwent processes of re-contextualization to adapt to local environments and cultures.²¹

This study highlights how these macro-level processes were experienced in daily life. Before the establishment of foreign settlements in Sicily, indigenous protohistoric communities were characterised by two main elements: communal areas for performing daily tasks and small houses of one or two rooms. In these communities, the sense of ownership over a house was likely limited, whereas belonging to the group or settlement as a whole was far more significant.

From the 7th century BC onwards, the picture changed, as seen at Monte Polizo and Monte Maranfusa. In House 1 at Monte Polizo and Building 2 at Monte Maranfusa, spaces designed to receive guests appear, reflecting a growing sense of attachment to the house. These features may have reinforced social bonds, expressed family power linked to newly acquired elite status, and projected traditional indigenous authority in the face of emerging colonial realities. Local traditions were thus incorporated into a broader, 'globalized' system through the creation of new shared meanings - a process aptly described as *hybridization*²². At the same time, the adoption of new practices was tempered by a desire to preserve long-standing lifestyles tied to identity, as evidenced by the persistence of culinary traditions. This continuity also reflects the Phoenicians' and Greeks' limited interest, at least during these early periods, in imposing new cultural or residential models. Comparisons with Phoenician and Greek colonial settlements, which featured different architectural and domestic forms, rarely led to direct imitation. Instead, indigenous Sicilian communities adapted selectively, maintaining established practices while formally incorporating novel elements. Substantial changes reflecting the acceptance of foreign models only became apparent over extended historical periods.

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²¹ For discussions on the significance of the house as a reflection of traditions and identity issues in contact zones, see Marín Aguilera (2018), in the case of Phoenicians and indigenous communities in the Bay of Naples and Andalusia.

²² On this term and its use in archaeology from a postcolonial perspective focused on the Ancient Mediterranean, see (van Dommelen 2006; 2008).

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Reconstructing Aspects of Everyday Life in Ancient Macedonia in the Classical and Hellenistic Era

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Abstract

The aim of this paper is to reconstruct various aspects of private and public life in the cities of ancient Macedonia through the study of the up-to date preserved archaeological evidence. The historical periods to be examined date from the era of Philip the Second who laid the foundations for the 'Macedonian domination' and Alexander the Great who made the 'Miracle that was Macedonia' happen until the period of the Successors and the 'unavoidable decline'.

The particular questions to be addressed are: how was a Macedonian city constructed (town planning, fortifications)? Where did Macedonians live (ancient Greek houses: types, lay-out, building materials, decoration)? Where were they governed from (administrative buildings and special rooms)? Where did the Macedonians 'hang out' (Agora: lay-out, functions)? Where did they worship their deities (sanctuaries, temples, shrines)? Where did Macedonians go to entertain themselves (theatre, gymnasium)? Where and how did they bury their dead (tombs and burial customs)?

Introduction

Ancient Macedonia has undoubtedly played a unique role in Ancient Greek history. The Macedonian Kingdom at its maximum 'European' expansion in the era of Philip II, extended beyond the modern boundaries of the Greek district of Macedonia. It occupied areas of modern northern Greece, Albania, Bulgaria, and North Macedonia. Moreover, during the reign of Alexander the Great it transformed into an immense Empire that extended over three continents (Europe, Asia, Africa) but would eventually be dissolved during the age of the Successors. The evidence, both historical and archaeological, for the formation and expansion of the Macedonian Kingdom until the late 6th BC is quite scanty. Herodotus (8. 139) records the line of succession of the Macedonian kings (Perdikkas – Argaios – Philip – Aeropos – Alketas) down to 540 BC, but there are not any other literary citations and the archaeological record for this period is fragmentary. From then onwards there are less gaps in the evidence. A brief mention of the history of the Macedonian Kingdom in relation to the major events in Ancient Greek history and the study of specific archaeological evidence will support the attempt to shed light on some aspects of everyday life in Macedonia in Classical and Hellenistic era.

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Historical Context

The reign of Amyntas I (540-498 BC) and partly of Alexander I (498-452 BC) coincides with the Persian campaigns in Europe. According to Herodotus, both Dareios (5. 17-21) and Xerxes (7. 25, 112-131), being attracted by the key position of Macedonia (standing on the main passage to southern Greece) and its natural resources (timber, silver and gold mines etc.), achieved its submission to the Persian Empire for the period of the Persian wars with Alexander I playing the role of the 'spy for the united Greek forces'.

The immediate gap by the Persian retreat after their defeat, not only led to the liberation of the Macedonian Kingdom and its subsequent affiliation with Athens, but also to its great expansion (Thucydides, 2. 99). The next momentous historical event, the Peloponnesian war, that broke out forced Perdikkas II (436-413 BC) to follow a compromise policy. He sided, on the basis of Macedonia's best interest on every occasion, sometimes with Sparta and sometimes with Athens, a policy that became even more applicable when (after 425 BC) the war's frontier moved to Macedonia and Thrace. This period of confusion was followed by an era of stability and great development (Thucydides, 2. 100) for the Macedonian Kingdom under Archelaos (413-399 BC). The borders were secured in several different directions through the establishment of diplomatic relations with Athens (which already had a number of established colonies at the area), Illyria, and Thessaly. Moreover, many sites were fortified, the army was reorganised, new roads were constructed, and the administrative centre of the Kingdom was moved from Aigeai to Pella. The next 40 years constitute a very turbulent period for Macedonia, since Amyntas III (393-370 BC) and his successor Perdikkas III (365-359 BC) had to deal with internal conflicts and external threats (the former Illyrians and Chalcidians, the latter Thebans, Athenians and Illyrians).

The sudden death of Perdikkas III eventually brought to the throne a very efficient and effective king, Philip II (359-336 BC). A genius in military tactics and diplomacy he managed to expand Macedonia to the North, South, East and West, convert it into an extremely powerful kingdom and himself be recognised as the 'hegemon of Greeks'. He made full preparations for a Panhellenic campaign against the Persians, but he was brutally murdered in Aigeai during the wedding of his daughter. His successor, Alexander III, was destined to become 'Great'. As the new 'hegemon of the Greeks', he led the anti-Persian campaign and the subsequent expedition that resulted in the formation of an empire that extended over three continents, Europe, Asia and Africa. His sudden death in Babylon (323 BC) initiated a new turbulent period for Macedonia, since a number of 'Successors' struggled for the Macedonian throne. For the next 165 years the Macedonian Kingdom experienced alternating periods of prosperity and decline. In 168 BC the defeat of the last Macedonian king, Perseus (179-168 BC), by the Romans led to the complete dissolution of the once 'mighty' Macedonian Empire (Borza 1990: 162-4, 207-13; Girtzi 2001: 31-9; Hammond and Griffith 1979: 59, 64-5, 99, 115-33, 172-80, 184-6, 210-46; Hammond 1980-81: 1-65; Hammond and Walbank 1988: 101-364; Hammond 1991: 13-4, 25-30; Τουράτσογλου 1996: 14-30).

Having traced the historical context, it is then necessary to examine some archaeological finds, specifically the architectural development of some major Macedonian sites. In order to reconstruct some aspects of the daily life in Ancient Macedonia through the study of the above archaeological evidence particular questions must be addressed below. Namely: How was a Macedonian city

constructed (town planning, fortifications)? Where did Macedonians live (ancient Greek houses: types, lay-out, building materials, decoration)? Where were they governed from (administrative buildings and special rooms)? Where did the Macedonians ‘hang out’ (Agora: lay-out, functions)? Where did they worship their deities (sanctuaries, temples, shrines)? Where did Macedonians go to entertain themselves (theatre, gymnasium)? Where and how did they bury their dead (tombs and burial customs)?

How Was a Macedonian City Constructed?

Town-Planning

The ideal system of town-planning for a ‘city’ is for Aristotle (*Politics* 1330b) the so called ‘Hippodamian’, that is to say a grid plan (a grid of streets separating blocks of equal size to accommodate private and public buildings). However, this was not the rule either for Southern Greece – which offers few examples (e.g., Peiraeus, Rhodes) – or for Macedonia. Although this regular layout produced a very comfortable and well-balanced way of living, potential for expansion along with an aesthetic and visually pleasing urban environment, it couldn’t be applied in certain circumstances, namely, when a city was older than the late 5th century BC when this system was introduced or when the ground was very steep. As a result, cities like the first traditional capital of the Macedonian Kingdom, Aigai, that date before the 5th century BC were arranged in a rather haphazard way using any open space and following an irregular pattern.

Moreover, other cities had to conform to the terrain features, so if they had to use steep ground with a certain elevation the immediate solution was *andera* (terraces). Aiane, in Upper Macedonia, for instance was laid out in terraces quite regularly. In this way, cities that were founded or rebuilt after 5th BC could apply the ‘Hippodamian’ system. Pella, the second traditional capital of the Macedonian Kingdom, belongs to the first case, being built in 400 BC following the grid plan. Olynthus in Chalcidice, belongs in a quite unique category: it consists of an early example of a city built in the grid plan since it had strong influence from the South. Being destroyed by Philip II, it was rebuilt afterwards, again following the ‘Hippodamian’ plan. These are a few representative examples of cities that present evidence for town-planning, proving that Macedonians used the system applicable in each case, similarly to Southern Greece. Since evidence for urban planning demands extensive excavation there is still a lot more to be done around Macedonia to add more examples of its type (Δρούγου and Σαατσόγλου-Παλιαδέλη 2005; Georgopoulou-Damiko 2003; Girtzi 2001; Καραμήτρου-Μεντεσίδη 2009; Λιλιμπάκη-Ακαμάτη and Ακαμάτης 2015).

Fortifications

The architectural feature that defines a ‘city’ figuratively, since self-defence is one of the main features for the definition an ancient Greek ‘city-state’ - and literally since it delimits the extent of a site - is its

fortifications. The literary evidence on this occasion is plentiful and, on many occasions, confirmed by the archaeological finds. For instance, Thucydides (1. 61, 2. 100, 5. 6) describes as *choria* (fortified places) a number of Macedonian sites, such as: Beroia, Europos, Atalante, Gortynia, Eidomene, and Kerdyllion. In addition, Diodorus (16. 8, 16. 49) mentions the fortifications of Pydna as strengthened by Philip II and later causing trouble for Kassander, while Livy (44. 46. 4-11) refers to Pella as *muro urbis* (fortified city). Excavations to date have attested the existence of fortification walls in many Macedonian sites, such as: Aigeai, Pella, Edessa, Aiane, Dion, Pydna, Stageira, Amphipolis, Philippoi, Thasos etc. The fortification walls of Macedonia, following the typical ancient Greek pattern were arranged in a more or less regular shape being reinforced with square or circular towers and gates (Δρούγου & Σαατσόγλου-Παλιαδέλη 2005; Georgopoulou-Damiko 2003; Girtzi 2001; Καραμήτρου-Μεντεσίδη 2009; Κουκούλη-Χρυσανθάκη and Μπακιρτζής 2009; Λαζαρίδης 2001; Λιλιμπάκη-Ακαμάτη and Ακαμάτης 2015; Pandermalis 1997; Papaefthymioy-Papanthimou 2015; Rhomiopoulou 2000; Sismanidis 2003; Τουράτσογλου 1996).

Where Did Macedonians Live?

Private Houses

Houses constitute another integral feature of a city, and their excavation produces plenty of evidence for the everyday life of the inhabitants. Various examples of private buildings have been discovered in Macedonia. In the majority of them the conventional architectural form of Southern Greece, the so called Greek *oikia* (ancient Greek House), where the rooms are arranged around a courtyard, was employed following different versions. For example, there were simpler houses that had a wide roofed hall at one end of the courtyard, identified as ‘houses with pastas’ (e.g. Olynthus, Pella) or more complex forms with a colonnade around the courtyard, characterised as ‘houses with peristyle’ (e.g. Pella, Dion, Mieza, Olynthus etc.). Sometimes, the houses had to follow the terrain features and were arranged in different levels on terraces.

In Macedonia two categories of these houses have been revealed: the first type followed the principles of the Greek *oikia* (e.g. Aiane, Tragilos, Argilos etc.), while the second consisted of houses without courtyards (the typical feature of the Greek *oikia*). The latter were divided in two types: the ‘house with narrow front and a roofed veranda’ and the ‘house with wider front in Γ shape’; they both constituted two-storey buildings (e.g. Petres), and were probably native formations aiming for simplicity. The above-mentioned Macedonian sites, as with almost every ancient Greek site, offered simultaneously examples of very simple houses along with very elaborate ones. For instance, some houses were huge in size, decorated with great mosaics (e.g. Pella, Olynthus etc.) or frescoes (e.g. Pella, Amphipolis etc.). Evidently, the quality of the construction of the residences indicates the social status of the residents, distinguishing the wealthy and the non-wealthy (Georgopoulou-Damiko 2003; Girtzi 2001; Καραμήτρου-Μεντεσίδη 2009; Λαζαρίδης 2001; Λιλιμπάκη-Ακαμάτη and Ακαμάτης 2015; Rhomiopoulou 2000; Τουράτσογλου 1996).

Palaces

A totally unique architectural feature of ancient Macedonia, in contrast to the typical Southern Greek cities, is the palace. In the successive capitals of the Macedonian Kingdom palaces have come to light. In Aigeai the palace followed the principles of Greek *oikia*, accommodating a number of rooms with different uses (e.g. symposia-rooms, throne-room, prytaneion, archive, storerooms, residential quarters etc.) arranged around a huge courtyard. In Pella the palace consisted of three building units comprising several structures with different functions (e.g. open spaces for public gatherings, offices, baths, storerooms, residential quarters etc.). This architectural element being in fact entirely incompatible with the democratic or oligarchic constitutions of the southern Greek cities was on the other hand eminently suitable for the monarchs of the Macedonian Kingdom. It is worth mentioning that the palace had both private and public function, since it served both residential and administrative functions (Δρούγου and Σαατσόγλου-Παλιαδέλη 2005; Georgopoulou-Damiko 2003; Girtzi 2001; Λιλιμπάκη-Ακαμάτη and Ακαμάτης 2015; Τουράτσογλου 1996).

Where Were the Macedonians Governed from? - Where Did they ‘Hang Out’?

Agora

The palace was not the only place from which the Macedonians were governed. The other architectural feature - which actually served a lot more than an administrative function - was the Agora. The Agora was one of the most important elements of an ancient Greek city. It was the place where ‘the heart of a city beats’ with multiple functions (e.g., political, legal, economic, religious, social etc.). Its typical layout consisted of an open space with a number of buildings or/and stoas at the perimeter accommodating rooms for officials or judges, places for public gatherings, shops and workshops, shrines or temples etc. In cities built on the ‘Hippodamian’ system (e.g., Pella, Olynthus etc.) the Agora was incorporated in the grid plan occupying a significant number of blocks.

Regarding ancient Macedonia, the best-preserved example of agora to date is that of Pella. It followed the typical ancient Greek pattern: it was spacious occupying 10 normal building blocks plus five smaller ones, and the stoas that surrounded the huge open courtyard accommodated shops (selling food, wine, oil, perfumes, terracottas, pottery etc.), workshops (manufacturing figurines, pottery etc.), public buildings (housing the archive, the seat of the assembly of magistrates etc.) etc. Other simpler examples of agoras that have been excavated up-to-now are located in Olynthus, Stageira, Thasos, Aiane, Dion, Mieza etc. It became clear that the obvious place where the Macedonians – just like the citizens of Southern Greek cities – not only were governed from but also ‘hung out’ was the Agora with its many-sided character (Girtzi 2001; Καραμήτρου-Μεντεσίδη 2009; Λιλιμπάκη-Ακαμάτη and Ακαμάτης 2015; Pandermalis 1997; Papaefthymioy-Papanthimou 2015; Rhomiopoulou 2000; Sismanidis 2003).

Where Did Macedonians Worship their Deities?

Sanctuaries in the Agora

The gods of a city are considered an integral part of the community that forms an ancient Greek city; therefore, the sanctuaries for their worship comprised one of its main elements. In Southern Greek cities there were numerous sanctuaries accommodating large, monumental temples. In ancient Macedonia, where religion played an equally essential role – since the king himself was the religious leader – there was a difference in form as far as the present archaeological finds attest. Namely, the majority of the Macedonian sanctuaries consisted of smaller temples or shrines. In Aigeai, Pella and Thasos the sanctuaries of Eukleia, Aphrodite & Cybele and Athena respectively, were located within the boundaries of the Agora, fulfilling its religious role. The existence of shrines or temples in the precinct of the Agora is a model also followed in the Southern Greek cities (Δρούγου and Σαατσόγλου-Παλιαδέλη 2005; Georgopoulou-Damiko 2003; Girtzi 2001; Λιλιμπάκη-Ακαμάτη and Ακαμάτης 2015; Papaefthymioy-Papanthimou 2015; Τουράτσογλου 1996).

Sanctuaries Outside the Agora

Along with the sanctuaries in the agoras of some Macedonian sites, a number of others have been identified in other areas. For instance, in Pella were situated the sanctuaries of Heracles and Daron, in Thessaloniki the sanctuary of Sarapis and Isis, in Tragilos the sanctuary of Aphrodite or Leda, in Stageira the Heroon of Aristotle etc. consisting of simpler constructions. However, there are exceptional cases such as the quite monumental so-called archaic temple of Thessaloniki or the pan-Macedonian sacred site of Dion. The latter formed a unique example since it consisted of many sanctuaries accommodating temples (some of them in the type of ancient Greek temples) dedicated to several deities (e.g. Demeter, Zeus Hysistos, Zeus Soter, Isis, Asclepius etc.) lying *extra muros*, outside the fortification walls of a city that was founded to serve the sanctuaries and not the other way around (as is more usual). The pan-Macedonian sanctified site of Dion soon became a pan-Hellenic sanctuary where Alexander the Great met envoys and armies from all over ancient Greece and performed the last sacrifices before they all set off for the anti-Persian campaign (Georgopoulou-Damiko 2003; Girtzi 2001; Λιλιμπάκη-Ακαμάτη and Ακαμάτης 2015; Pandermalis 1997; Τουράτσογλου 1996).

Where Did Macedonians Go to Entertain Themselves?

Theatre

Ancient drama, in the form of either tragedy or comedy, played a very important role in the daily life of ancient Greeks since it had a dual function, being a source of entertainment and simultaneously a means of education. The architectural feature that was intended for its performance was the ancient Greek theatre. Its conventional architectural form was adapted in ancient Macedonia, as can be confirmed

from archaeological and literary evidence. In Aigeai, the traditional first capital of the Macedonian Kingdom, the excavations brought to light an ancient theatre with a rare petal shape that became very famous as the scene of a murder that possibly changed history. In June 336 BC, during the marriage of Cleopatra, Philip's II daughter, the king was brutally murdered! In addition, in Pella, the second capital of ancient Macedonia, according to Plutarch (*Moralia*, 13) there was a theatre (not yet discovered) where the tragedies that Euripides - when he lived as a guest of king Archelaus - composed were performed. Eventually, theatres in the typical Greek form have been uncovered in several other Macedonian sites (e.g., Mieza, Dion, Philippi, Thasos etc.) (Δρούγου and Σαατσόγλου-Παλιαδέλη 2005; Georgopoulou-Damiko 2003; Girtzi 2001; Κουκούλη-Χρυσανθάκη and Μπακιρτζής 2009; Pandermalis 1997; Papaefthymioy-Papantimou 2015; Rhomiopoulou 2000; Τουράτσογλου 1996).

Gymnasium

Another architectural element that combines entertainment and leisure with education and physical (even military) training is the gymnasium. However, in this case evidence, both literary and archaeological, is still poor. Ps-Callisthenes (2. 15-16) mentions the gymnasium of Pella, while Polybius (4. 62) records the gymnasium of Dion where the Olympic Games at Dion took place from the time of Archelaus onwards. Moreover, the inscription known as the 'gymnasiarchal law' of Beroia testifies to the existence of a gymnasium there. Unfortunately, none of the above has been discovered yet. However, there are two sites where gymnasia in the typical architectural form have been excavated, Amphipolis and Mieza. The latter has recently been proved to be the place of the famous School of Aristotle where Alexander III and his friends were educated. The Macedonian gymnasia not only look similar to the ones in the rest of ancient Greece but also serve the same functions (Georgopoulou-Damiko 2003; Girtzi 2001; Λαζαρίδης 2001; Rhomiopoulou 2000; Τουράτσογλου 1996).

Where Did Macedonians Bury their Dead?

Cemeteries

Cemeteries are an integral part of an ancient Greek city serving an unavoidable necessity, while they also served to designate the boundaries of a site. In the Macedonian Kingdom the traditional ancient Greek types of burials, such as pit-graves, cist-graves (e.g. the 'tomb of Persephone' in Aigeai and the 'tomb of Lyson and Kallikles' in Lefkadia with the unique wall paintings), and rock-cut chamber tombs were all employed. Nevertheless, along with the above a totally new type was introduced there, the so called 'Macedonian tombs', a great number of which have been excavated all over Macedonia (e.g. in Aigeai, Mieza-Lefkadia, Pella, Dion, Thessaloniki, Beroia, Pydna, Aiane, Agios Athanasios, etc.). They were underground structures with vaulted roofs, comprising of one to three chambers, bearing on some occasions a decorated façade. The construction of these tombs was probably the result of the existence of the Macedonian monarchy, since they were initiated as royal tombs (e.g., in Aigeai the 'tomb of Philip',

the ‘tomb of Euridice’, the ‘tomb of the Prince’ etc.), but soon their use spread throughout Macedonian high society (Δρούγου & Σαατσόγλου-Παλιαδέλη 2005; Georgopoulou-Damiko 2003; Girtzi 2001; Καραμήτρου-Μεντεσίδη 2009; Κουκούλη-Χρυσανθάκη and Μπακιρτζής 2009; Λαζαρίδης 2001; Λιλιμπάκη-Ακαμάτη and Ακαμάτης 2015; Pandermalis 1997; Papaefthymioy-Papanthimou 2015; Rhomiopoulou 2000; Sismanidis 2003; Τουράτσογλου 1996).

Conclusions

In this paper an attempt has been made to present aspects of private and public life in the cities of Ancient Macedonia in late classical and Hellenistic times through the study of the up-to-date preserved literary and archaeological evidence. Having initially introduced the historical context, some archaeological finds, specifically the architectural development of some major Macedonian sites were examined in order to reconstruct certain aspects of daily life in Ancient Macedonia.

The questions that have been addressed are: how was a Macedonian city constructed (town planning, fortifications)? Where did Macedonians live (ancient Greek houses: types, lay-out, building materials, decoration)? Where were they governed from (administrative buildings and special rooms)? Where did the Macedonians ‘hang out’ (Agora: lay-out, functions)? Where did they worship their deities (sanctuaries, temples, shrines)? Where did Macedonians go to entertain themselves (theatre, gymnasium)? Where and how did they bury their dead (tombs and burial customs)? Although there is still a lot more excavation to be carried out around Macedonia in order to be able to reconstruct a complete picture of everyday life it becomes evident that the main features are similar to those in the rest of Ancient Greece.

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Architecture which Travelled over the Seas: The Church in Dereağzı Case Study

Evelina Kachynska¹

Abstract

In the village of Dereağzı in southern Turkey there are the ruins of a Byzantine church of considerable size. Based on the preserved architectural and decorative elements, we can conclude that it was erected in the Middle Byzantine period. More detailed architectural research has established its link with the Constantinopolitan school, as shown by certain structural and technical features and elements of architectural decoration. However, the layout of the domed basilica referred to an earlier architectural type.

Both the dimensions and the grandeur of the church indicated the special importance of the building, which also may have been prototype for one of the oldest churches in Rus' - the Cathedral of the Transfiguration (Chernihiv). The church imitates the spatial arrangement of the church of Dereağzı with a slight simplification. The phenomenon of Byzantine architectural patterns being adopted by Rus' after its Christianisation in 988 is undeniable, but the exact origin of the patterns or the building workshops themselves remains an open question.

Introduction

The ruins of the Byzantine church in Dereağzı (nowadays a small village close to Demre) mainly consist of the remains of walls and one bay of a barrel vault. However, the grandeur of the building, because of its dimensions and the monumentality, is still highly impressive to the visitors. Narrowing down the areas around the site of interest, we should mention Kasaba plain in Kaş district (Antalya province) (Morganstern 1983: 21), which is formed as a long and significantly narrow dell inland (Morganstern 1983: 30).

The history of the valley is not completely known: this area belonged to the region of Lycia in the Roman period, and later under the Byzantine Empire became a part of the Cibyrrhaeot Theme (Kazhdan 1991: 1127), which existed between the 8th and 12th centuries. All churches and monasteries dating from at least the middle of the 5th century were already included in the Lycian eparchy (Hild and Hellenkemper 2004: 1-17), falling under the jurisdiction of the metropolitan of Myra. Using hagiography in particular from the 6th century, we can find allegedly references to the valley area in the *Vita Nicolai Sionitae*, but

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comparing the actual topography to the information from the texts is not precise enough (Foss 1991; 1994).

By the south-eastern wall of the valley are the ruins of the fortress, which were visible back in 1968 (Morganstern 1993: 27-41), but currently due to the development of land for agriculture are not easily accessible. Photos from 1967-68 show that the construction is already in an advanced state of ruin, nevertheless the outlines of the pentagonal tower are still visible. The basic configuration of much of the fort was established in the Lycian period and the complex was reinforced and expanded in the Byzantine period. The existence of the ruined church was not a particular mystery to researchers and travelers, beginning in 1836, when the French traveler Charles Texier took pioneering measurements and drew up a sketch plan of the building, even trying to reconstruct the possible appearance of the structure, in the form of a drawing with a longitudinal section (Morganstern 1983: 25, Fig. 3). In the following years, more plans, photos, and descriptions of the building appeared, usually quite similar in nature; unfortunately they didn't bring any new information. Finally, in 1965 the church appeared in the multi-volume work by Richard Krautheimer, but it still remained *de facto* an enigma in the context of identification of the settlement and the building itself.



Figure 1. View of the remains of the south octagonal building with still visible marble cornice (Photo by the Author).

Architectural Analysis of the Church

As was mentioned earlier, the building has significant dimensions, to be precise: total length 39m, width 21m, diameter of the dome 8m, which can also be described as typical for a high-ranking building of regional importance. Even before the discovery of the missing data on the object, this raised further questions: could the complex have been a pilgrimage center, or was it a particularly important point in the religious life of the entire region?

As for the formal analysis of the architecture of the church, it is necessary to follow a systematic description, starting with the spatial layout of the building, which will help in the further reading of the elements of the building. The general architectural form of the church can be described as a domed basilica, a longitudinal central part of the building, connected with additional octagonal buildings (Figure 1) of uncertain purpose with eastern oriented apses on the south and north sides, connected by aisles with short corridors (Figure 2). We can assume that they did not function as pastophoria, since there are two rooms at the end of the aisles from the eastern part, which, as we shall see, were intended for these purposes.

On the east side, each nave is closed by a polygonal apse, while on the west side there is a narthex with towers that house the staircases and monumental exo-narthex. The doorways of the exo-narthex and the narthex are on the same axes, and the central part of the exo-narthex extends slightly beyond the front of the façade, further emphasizing the central entrance. This part also has a different vaults – cross-vaults rather than barrel as in the others. Besides the additional octagonal rooms, the monumental exo-narthex is unusual in Middle Byzantine architecture, even in its provincial version.

The exo-narthex also has an interesting element in the form of an unfinished arch close to the last north pillar, the purpose of which remains in doubt; a theory has been put forward that this may have been a stonemason/builder's mistake or a reference to a double-arched entrance as we can see at the Church of Constantine Lips (Morganstern 1983: 32; Megaw 1964: 295). Due to the current state of conservation and the current level of the ground, the question remains open, as it requires further archaeological and architectural research. The narthex has the shape of an elongated rectangle, the central part forming a single space from which the entrance to the nave is made, the two side parts of the narthex correspond in width to the side aisles and are connected by passages to the towers with staircases. There are windows in the walls between the opening doors, the vaults in all bays are cross-shaped.

The naos of the church is very clearly demarcated by both the dome itself and the arrangement of the walls and arcades. Most of the building uses a pillar system, while the central part of the nave is separated from the side aisles by columns. The central space was visibly dominated by the dome, supported on pendentives, the central nave covered by barrel vaults (Figure 3) (Morganstern 1983: fold-out 2). The side aisles are divided into five bays, of which the central three are horizontal rectangles and the first and last are square. The pastophoria have a very significant shape, based on the *quatrefoil* form, the eastern parts ending with an apsidola, extended to the east and the rest of the sides have niches on the width of the wall. It is important to emphasize the choice of such a spatial solution, which

required careful planning and the appropriate skills of both the architect and the builder. On the basis of the elements that have survived, we can conclude that the vaults were crossed-shaped, as in other parts of the building, such as the narthex.

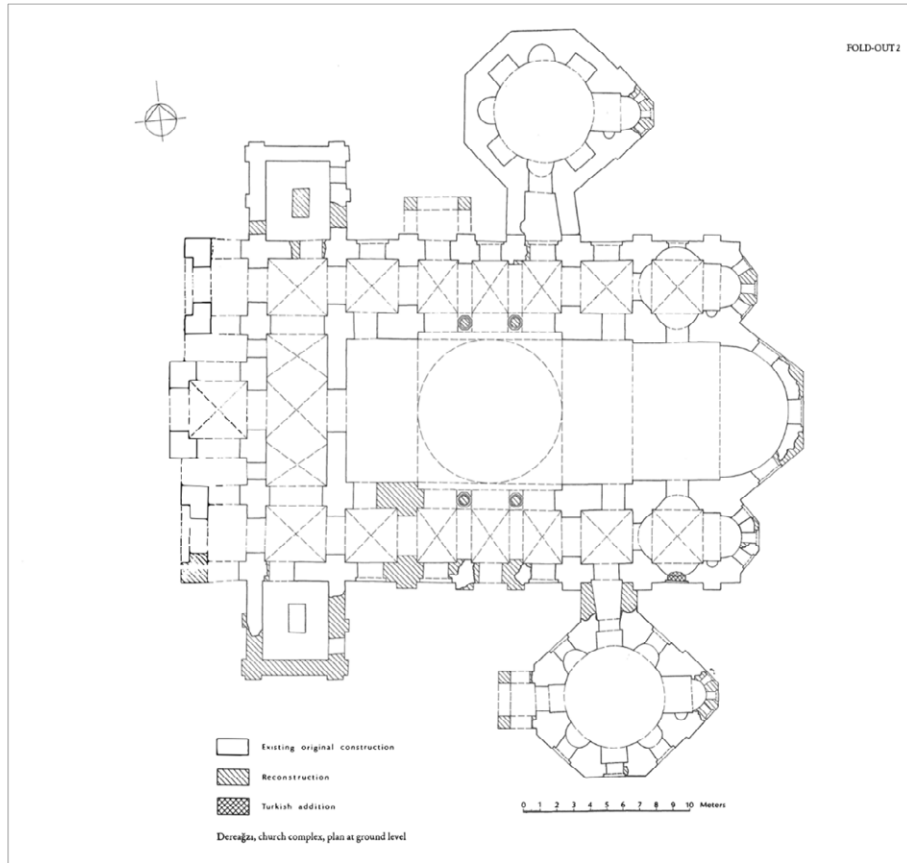


Figure 2. Dereğizi church, ground level layout (After Morganstern 1983).

The towers were built on a square plan, with a staircase leading to the gallery above the narthex, which corresponds in size to the narthex and in the division of its space: a separate rectangular central part and square side parts. According to previous studies of the church ruins, the central part of the church opened onto the nave through a triple arcade (Morganstern 1983: 49). The vaults of the galleries have unfortunately not survived, but from the remains of fragments near the upper parts of the wall it can be concluded that the central part had cross-shaped vaults with elongated arms on the north-south axis, while the side parts had simple cross-shaped vaults. The pavement has not survived, besides the mortar layer. The galleries, above the side aisles, correspond to the lower level in the arrangement of the bays (Figure 4). The walls of the galleries were surrounded by a continuous cornice of Proconesian marble, as on the lower level. The upper parts have been preserved mainly in the central part; despite the poor state of preservation, we can see that the bays are separated by arches located under the cornice. Above the pastophoria, there are rooms that have been identified as chapels, reproducing the

layout of the *quatrefoil*, and it is assumed that the vaults also corresponded to those of the pastophoria: the central space was under a cross-shaped vault, with each niche covered by a semi-dome.



Figure 3. View on the remains of the barrel vault and pendentives from the south aisle (Photo by the Author).

A peculiarity of the building is undoubtedly the presence of two annexes on an octagonal plan. As already mentioned, the function of the rooms is not fully understood, especially in view of the presence of the specially separated pastophoria. Some researchers find models for these buildings in the architecture of Constantinople, especially the baptistery (the so-called small baptistery) (Vinogradov 2021: 44) and the *skeuophylakion* (Morganstern 1983: 76) of St. Sophia of Constantinople: in fact, as in the church, the *skeuophylakion* (with traces of shelves in rectangular niches) on the north side is connected by a passage, while the second building, the so-called baptistery, on the south side is isolated from it.

The exterior of the church currently can be reconstructed solely on the basis of the plaster remains on the external walls, therefore *opus mixtum* brickwork was not intended to be seen. One of the outer niches in the octagonal building still had remains of the paintings on its plaster, and back in 1968 this was still recognizable as Latin crosses (Morganstern 1983: 127). The types of pavements of the church unfortunately remain unclear, they are rather destroyed or buried under the layer of soil. Internal decoration of the church, besides marble cornices, was partially accessible in 1968 *in situ*, but the state

of preservation was already very bad at that time. There were fragments of marble and limestone architectural decoration, small pieces of wall mosaics in *opus tessera* technique and remains of wall paintings (Morganstern 1983: Pls. 1-49). The architect did not reproduce one to one an object from the capital but prepared a paraphrase of the architectural forms of the famous baptistery. In the case of the presumed *skeuophylakion*, the function was determined by the remains of niches and shelves that must have been used to store liturgical vessels. The second assumption is a function as a funeral chapel (Morganstern 1983: 76) in analogy with Eski Gümüş (Gough 1964: 147, Fig. 2), the Katholikon of the Great Lavra on Mt. Athos and the Saviour-Transfiguration Cathedral (Spaso-Preobrazhenskii) in Chernihiv.

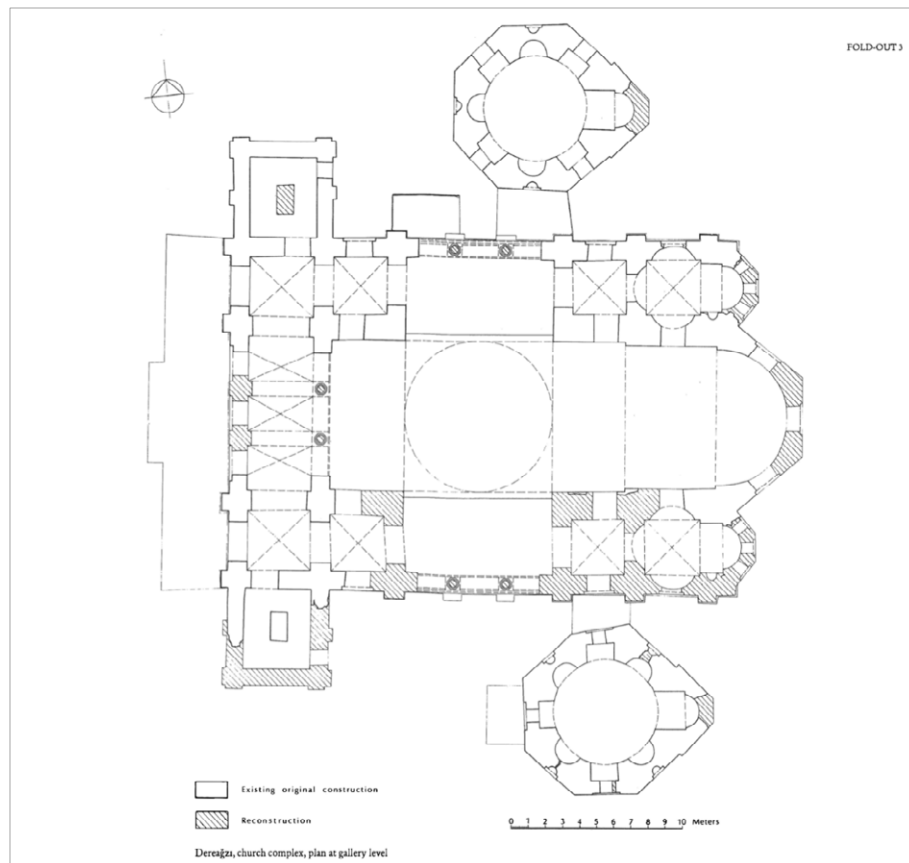


Figure 4. Dereğizi church, galleries level layout (After Morganstern 1983).

The architecture of the Middle Byzantine period reflects the changes in the nature of Byzantine society since the transitional period from the 7th to the 9th century (plague, famine, Arab invasions, iconoclast controversy, de-urbanization, cultural break). Changes in worship practices dictated a smaller scale of buildings, often for private devotion. The symbolic significance of the dome was retained, but with a radical reduction in scale (Ousterhout 2019: 303-33). Starting from the 9th century, many new types of church buildings appeared in Byzantium, completely original or radically reworked old ones (Krautheimer 1965: 390), but especially referring to Constantinopolitan influences we can see the emergence of an architectural type – the cross-in-square church. Due to the temporary impossibility of

identifying the church due to the insufficiency of both written and material sources, the general plan, size and monumentality of the building has raised many questions among researchers (Mango 1974: 92-7).

The reasons for the construction of such an unusual building in terms of size and complexity has remained unclear for a long time. First of all, the basilica plan, even crowned by a dome, is rather archaic for the time when the church was built, i.e. the 9th century. Only the identification of a settlement that once existed in the Kasaba valley and the identification of the church itself helped to put forward a theory about the choice of such a spatial layout. The church in Dereag zı was the cathedral of the city of Mastaura (Henning 2007: 143) (gr. *Μάσταυρα*), a strategic point at the exit of the Myros River to the plain of Kasaba, and the second most important bishopric of Lycia after Myra (Hild and Hellenkemper 2004: 716-8). Researchers believe that the construction of the church is linked to the reorganisation of the Lycian metropolis between 869 and 901-7, when the episcopal center of Mastaura descended onto the plain from the acropolis. References to the bishopric of Mastaura also appear in the *Notitiae Episcopatum* (Darrouz s 1981) under the 7th and 9th centuries as a bishopric, the most important among suffragans of the metropolitan see of Myra (Gelzer 1901: 539, 554, Nos. 254, 311), which means basically that it belongs to a province (metropolis) but is not its capital. The only bishop of Mastaura in Lycia, not Caria, mentioned in the sources is Baanes, who came to the Photian Council of Constantinople in 879 (Culerrier 1987: 157). Based on this information and architectural features, the church in Dereag zı can be dated to the second half of the 9th century.

It is presumed that its proximity to the famous metropolis of Myra led to the choice of spatial layout of domed basilica, as reference to the cathedral of St Nicholas. However, the similarity did not mean an identical reproduction of the 6th-century building; the church in Mastaura incorporated the latest technical and structural solutions. The arms of the cross were open on the second tier, as in the church of St Irene in Constantinople after its rebuilding in the 8th century (Peschlow 1996: 133-6). As A. Vinogradov (2021: 42) pointed out, the construction of the Mastaura church is frame structured, this means that all the upper elements (vaults, dome) rest on pillars rather than walls, which is typical of Byzantine churches in Asia Minor. Due to the large number of arcade and window openings, such as the elongated windows of the apse, the entire body of the building appears quite light.

Many elements and architectural features of the church in Mastaura (Dereag zı) can be characterised as Constantinopolitan influences; besides the constructional system we can point to the plan of the building which includes an exo-narthex, continuous cornices, cross-shaped vaults and to the type of brickwork – *opus mixtum*. Particularly noteworthy is the complex spatial arrangement of the pastophoria and chapels, especially as it is repeated on two levels. Previous attempts to identify and analyze the architectural forms of the building lead us to another fundamental question: is it the work of masters from the capital or an imitation of Constantinopolitan forms? Due to the complex and undoubtedly individual development of the church's spatial layout, researchers are inclined to believe that these were masters who came directly from Constantinople. They did not blindly reproduce the metropolitan examples in Mastaura, but creatively developed them, creating a completely unique

building. Based on this, it has been suggested that the construction of the church may have been related to not only the Bishop of Mastaura, but also some wealthy official, possibly the diikite of Mastaura known from the seals (Vinogradov 2021: 45).

Regarding the question of the influence of the architecture of the Mastaura church on later buildings, I would like to focus on the example of Chernihiv's Saviour-Transfiguration Cathedral. Its construction began before 1036, and the cathedral was the most important church in the Principality of Chernihiv, ruled by Mstislav Volodymyrovych. Today it is one of the best-preserved churches from the time of Rus'. Researchers assume that the prince followed his father Volodymyr the Great in many aspects. It should also be mentioned that even before the construction of the church in Chernihiv, Mstislav founded the Cathedral of the Mother of God (990/1010-1023) in Tmutarakan, which has not survived to the present day. The architecture of the church was inspired by the schools of Alanya and Abkhazia, associated with the Byzantine provinces of Asia Minor. It is assumed that the church was built during the reign of Mstislav (1024-1036), but this is of course an approximate date. By the time of the prince's death in 1036 (this date is also generally accepted despite some discrepancies in the various written sources), the church walls had reached the height of a man standing on a horse with one arm outstretched (Chernenko 2021: 358): 'и положиша и въ цркви сѣго Сїса. юже создалъ самъ. бѣ бо въздано єа при немъ. възвыше ꙗко на конѣ сточи рукою досахи' (*Primary Chronicle* 2: 138 (under 1034); *Complete Collection of Russian Chronicle* 1: 150 (under 1036)), i.e. approximately 3.5m (Komech 2007: 135).

The sources do not provide accurate information on the completion of construction, but most often it is associated with reigning of Prince Sviatoslav Yaroslavich in Chernihiv (1054–1076). In 1076 there is a reference to the burial of Prince Sviatoslav in the church, which means that the construction should have been completed by then (*Complete Collection of Russian Chronicle* 2: 190). On the basis of this information, it can be concluded that the process of construction had at least two stages: the first one - beginning of construction by Mstislav and the second - ending of the work after his death (Chernenko and Ioannisyan 2017: 106).

In the search for analogies, it is necessary to start with the plans of the buildings, which show some similarities, while retaining distinct elements. The general plan of the domed basilica with a similar layout has been preserved, with the exception of the exo-narthex, which was not necessary in the climatic conditions of the Rus', which were very different from those of the Mediterranean area. The example in Chernihiv has characteristic features of a basilica, such as columns of three-span arcades widely spaced between the subdome pylons, the dome was in the geometric center (Chernenko 2019: 26). Its length is 33.2m, its width is 22.1m, its height is 29m (from the modern level; 30m from the old level) (Chernenko 2019: 26). The towers, which housed the staircases, remained at the level of the narthex, but had a circular rather than a square plan (Figure 5).

A wall separates the narthex from the nave; they are connected through arched openings located along the axes of the nave. Four cross-shaped pillars supported by arches support the central dome and create the form of the sub-dome space. In the western part of the temple have been preserved galleries with

an entrance from the northern tower. They are arranged on the vaults of the narthex. The previous arrangement of the altar was changed in the 17th century. During archeological excavations in 1968, the remains of the original synthronon and bishop's throne and a wooden pre-altar fence (*templon*) were discovered in the central apse (Chernenko 2019: 28). Distinctive octagonal buildings have been replaced by rectangular chapels with apses on the east side (Figure 5), dating from the time of the church's construction. The brickwork is an *opus mixtum*, made with hewn blocks of limestone and a plinth on a dark pink mortar (Chernenko 2019: 27).

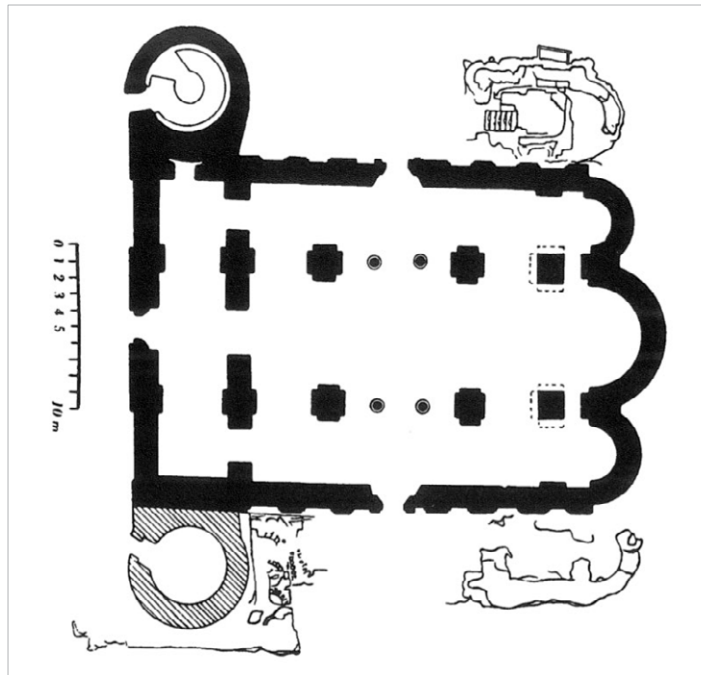


Figure 5. Saviour-Transfiguration Cathedral in Chernihiv, ground level layout (After Morganstern 1983).

The construction process of the church, as previously mentioned, is divided into two main phases, the first of which belongs to the initial stage of the development of brick church architecture in Rus' (989-1036). This period was crucial for the formation of the phenomenon of masonry sacred architecture in Rus' and is associated with the presence of the first Byzantine influences in the lands of Rus', which did not come from Constantinople itself, as previously thought, but had connections with provincial architectural traditions - Balkan (Bulgarian) and Asia Minor-Caucasian (Chernenko 2021: 355).

As part of the discussion of the Chernihiv example, I would like to mention the Church of the Tithes. Recent archaeological research has somewhat revolutionized our view of the spatial layout of the church. It has been confirmed that the core of the building was a basilica, probably in the form of a domed version. For a long time, it was thought that the building represented a cross-in-square type, but excavations have shown that the lack of a suitable supporting wall meant that this construction system could not be used (Chernenko 2021: 356). At the end of the 10th century in Constantinople, churches were no longer built on the grand scale that they had been at the time of the establishment of the

Empire. The models for the first sacred masonry building in Rus' were found in Bulgarian architecture, because in the Balkan region in the 10th century buildings of larger size and often of the domed basilica type were still being built (Chernenko 2021: 357). Moreover, in the case of the Church of the Tithes, convergences with the Bulgarian tradition are evident in other aspects: the shape of the foundations and even the inscriptions on the plinths, which could be a reference to the involvement of Bulgarian builders, among others (Ivakin *et al.* 2010). In its first phase, the cathedral in Chernihiv was created in the traditions typical of Asia Minor-Caucasian provincial Byzantine architecture. During the second stage of the construction, when building was finally completed, it is assumed that the builders came from Constantinople (Chernenko 2019: 29).

Conclusion

The question of adaptation of the Byzantine architectural patterns from provincial centres rather than the capital remains open and opens the field for discussion. The current state of knowledge does not allow us to conclude unequivocally why patterns, which were transferred to the territory of the Rus' at the initial stage of the development of its architectural tradition, came mainly from Asia Minor territory.

However, based on the previous studies and research, we can admit that one of the possible answers is that the young Christian state, which Rus' was at that time, wanted to build colossal monuments to its new religion, namely churches. The similarities between the layout of the church at Mastaura (Dereağzi) and the cathedral in Chernihiv are undeniable, the slightly more northern version of the Mediterranean building is a very interesting example of the process of adapting Byzantine architectural patterns to the territory of Rus'.

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The Granarium as a Focus of Sea-Borne Memory: The Case of Andriake

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Abstract

The granarium (Horrea Hadriani) in Andriake, the harbour of Myra, is one of the most important imperial silos in the Mediterranean, built on the orders of Emperor Hadrian. The granarium, which forms the centre of the port of Andriake together with the agora and other port structures, was a central warehouse where thousands of objects transported to the port by sea were stored, preserved and traded for hundreds of years. This warehouse has become a repository of memory, a collection of witnesses, not only in terms of the archaeology of the objects, but also in terms of the rich information that the objects carry.

The information from the granarium illuminates the functioning of ports in the Roman Imperial Period, port storage systems, the management of public buildings in the ports, and the ports' socio-economic dimensions. This study intends to explore the story of the granarium from the 2nd century AD to the 7th century AD, the scientific data it provides, and the collection and movement of memory as ships traveled to Andriake from any port in the Mediterranean.

Introduction

At a basic level, storage enables people and their families to house vital necessities such as food for the future, seeds for next year, and fodder for animals. However, storage not only supports this function, but also people's place in the social network and society, their concerns and expectations, in short, their existence as a social being (Oyen 2020: 15). The control and ownership of storage constitute the basic parameters. And the state had an undeniably important role in the organization of Rome's needs in the form of imperial rule (Oyen 2020: 131). For the case of Andriake, first of all we will start with the background to understand the importance of the harbour and the Horrea Hadriani.

The first engravings of the port settlement of Andriake, located 4.7km (Çevik-Bulut 2010: 25) southwest of Myra, were made by L. Meyer in 1803. In 1811, it was mentioned in the documents of F. Beaufort (Beaufort 2002: 25), among other 19th-20th century travelers. The first comprehensive archaeological survey in and around Myra was conducted by J. Borchardt (Çevik 2010: 25) and his team between 1965-1968 and was published in 1975. The first comprehensive excavations and research in Myra and

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Andriake were initiated by Nevzat Çevik in 2009 and are still ongoing under his direction on behalf of the Ministry of Culture and Tourism and Akdeniz University. Since 2009, systematic archaeological excavations and the resulting publications have enabled us to ask new questions. During the excavations in Andriake in 2009, the first excavation area was the granarium, the largest and most symbolic building in the harbour, and the agora/Placoma, which is functionally and organically connected to it (Çevik 2009: 57).

Maritime Trade in Lycia and the Port of Andriake

Trade has played the most important role in the lives of societies and states since ancient times. To promote trade, states organised activities such as the buying and selling of emptio (commodity-goods), exchange, donations, and gift-giving. Thus, clusters of trade areas were formed in and around the Mediterranean, which came to the fore. Increasingly intensified maritime trade reached enormous dimensions with the addition of new routes throughout the Mediterranean. The shipwrecks of Kumluca (16th century BC), Uluburun (14th century BC), and Gelidonya (12th century BC) are extremely important for understanding maritime trade and seafaring, particularly for the region of Lycia, which gradually gained strategic importance in the ancient Mediterranean. These data give us information that the Lycian coast has held an important position in terms of maritime trade since the Bronze Age (Bass 1961). During the Roman period, one of the first works carried out was road construction between Lycian cities, which strengthened transportation, trade, security and communication networks within the province. In addition to land transportation, sea routes were also followed. Connections between the mainland and the islands were also provided by sea.

Sea connections were preferred over land transportation, which is long, dangerous and more troublesome due to the topography. Even between the ports of Andriake and Phoenicia, which are not very far apart, cargo transportation was provided not by land but by regular sea voyages (Çevik 2015: 45). After the 3rd and 2nd centuries BC, the Roman Empire began to dominate the Lycian coast and the Mediterranean. It is known that the Lycian coast, with its many harbours and shelters, helped ensure the flow of traffic by serving the region through ports, like the large ports of Andriake and Patara. The shipyards and dry docks in these ports contributed to their popularity, especially during unfavorable weather conditions. These facilities, the fact that the ports are lined up one after another, and Lycia's ideal location, which provides strong connections between east and west over a wide area of sovereignty, contributed to its indispensability (Çevik 2021: 41). Maritime transportation and commercial activities cannot be carried out uninterruptedly in the Mediterranean, thanks to the adverse winds and unfavorable weather conditions that prevent ships from sailing outside of the sailing season, which is between March and November (Jones 1966: 312). The development of the large port cities in Lycia gained momentum during the Roman Imperial period. Lycia is situated where sea routes meet and intersect, as well as being a region of production and export. The trade route starting from Egypt stopped at Cyprus, the Lycian coast, Tenedos, and Abydos on its way to Constantinople, and this route continued to be used for a significant period of time (Laiou and Morrison 2007: 35). During the

Roman period, grain coming from Alexandria and heading to Rome was stored in the granarium structures in the ports of Andriake and Patara.

In the Mediterranean, the concept of the *annona*, which gained prominence in the late Roman Republic, is essential to discussing the systemization of trade. The concept of the *annona* is important for understanding socioeconomic and commercial relations in the city and surrounding area. The word refers to the provision and storage of the necessary amount of food, grain, oil and wine for the survival of the city and its inhabitants. Until the 3rd century AD, the state's involvement and support was limited to grain and, to a lesser extent, oil.² In the Late Roman Imperial period, this system, *annona civica*, ensured that some large and/or important cities within its borders were supported with basic foodstuffs. The *annona* was also concerned with the supply of the army. The *annona militaris* was a set of practices aimed at meeting the military's basic food needs in order to ensure the continuity of the state. The aim was to ensure that the basic needs of the military, which were being collected in return for taxes, came from the provinces and locally. In return for this, it is known that the necessary products were purchased from the local civilian population in return for taxes, paid by the state or realised through trade. While the supply of corn for the army was a practice by the 2nd century AD, it is not yet known when and how it became a system of taxation (Whittaker and Garnsey 1998: 277).

In the Byzantine period, customs were established in the ports of Constantinople and Abydos to combat smuggling activities and tax all export-import goods at the highest level (Mango 1994: 65). Similarly, during the Roman Imperial period, customs were also located in the port of Andriake in Lycia. The presence of the inscription containing the Lycian Union Customs Law in Andriake during Nero's reign reveals once again how important the harbour was (Çevik *et al.* 2014: 227). The inscription is dated to the time of C. Licinius Mucianus, Governor of Lycia during Nero's reign, between AD 60-63 (Takmer 2006: 3). This inscription proves with certainty that the commercial dimension of the harbour during Nero's reign went beyond the borders of the defended area and developed from the settlement to the inner parts of the harbour (Takmer 2006: 9). There should be two main reasons for the increase in the preference for Lycian harbours, especially during the Roman Period: geography and the commercial opportunities that developed due to their geographical location (Yilmaz 2016: 143-4).

In antiquity, the ideal model was always about self-sufficiency. The idea was that the city and its inhabitants should not be dependent on resources outside the city, still less on products supplied from distant lands. However, unbalanced population growth forced ancient cities and urbanism to move in the opposite direction. During and after the Augustan period, when the state and the empire was responsible for such a large amount of capital, it had to provide the necessary foodstuffs. They had to take into account not only numerical, but also political, psychological and emotional factors (Geraci 2018: 220). Rickman mentions two grain stores which he thinks may be related to the *annona civica* (Rickman 1970: 55). He suggests that these two buildings are Asiatic *horrea* and could be the 'Horrea Hadriani' built during the reign of Hadrian in Patara and Andriake. At the same time, as a suggestion,

² For an overview of wine and oil, see (Virilouvet 2000: 106-7); for grain, see (Rickman 1980).

he mentions that the *horreum* structure in Andriake was an important stop on the corn trade route from Egypt to Rome (Rickman 1970: 66). In addition, a similar *horreum* structure dated to the time of Justinian and similar to those in Andriake and Patara was built on the island of Tenedos, one of the *annona civica* storage stops for Constantinople.

Horreum/Granarium

One of the biggest problems for the central administration of the Roman Empire was to meet the needs of the growing city. The ever-expanding population and the construction activities that emerged in line with their needs made Rome more and more attractive. In order to prevent problems in providing food for the growing population, security became extremely important in the shipment of grain and corn from Egypt, North Africa and Sicily. After the grain was safely transported to ports and cities, it needed suitable warehouses to be stored in sanitary conditions. In extremely hot and humid environments, grain can become damp and start to germinate. In order to prevent or minimize this, the air conditioning inside the warehouses must be extremely perfect and kept under constant control.

A *horreum* is a structure for the storage of grain, but also for the storage of different types of commodities, characterised by its plans, which show the juxtaposition of more and/or fewer cells, with 'cells, single or double in depth, opening onto corridors or to the outside. They can have one or more floors' (Cavalier 2007: 59). These buildings could be both public and private. Especially in the Early Empire, they could vary from the size of a family business to the size of an Imperial structure. (Oyen 2020: 159-60). Although Rickman states that 'it is possible that earlier horrearean buildings did not have systems of this nature because this technique was not found in buildings earlier than the second century' (Rickman 1970: 293-7), long before this date, the technique of the sub-hollow floor was in widespread use in Roman buildings. When grain stores with raised wooden floors or grain stores constructed of tiles are considered, the floors and walls need careful maintenance. For example, a building with pilasters would have had a different structure than limestone or marble and would contain *opus signinum* (flooring made of broken shells) (Rickman 1970: 293-7).

In the Roman Imperial period, the purpose of designing granaries was to keep the grain away from the humidity by storing it in dry, cool environments. At the same time, measures were taken against insects and moths. This was achieved by having wooden floors raised with *suspensurae* (scaffolding), exterior walls 1-metre thick, interior walls at least 0.80m thick with smaller buttresses, and locked entrances through the doors to ensure proper drainage. In terms of storage method, if grain is stored in loose fabrics or boxes, the walls of a grain storehouse are expected to withstand significant lateral thrust. In this case, the durability of the granary at Andriake can be supported by the fact that the outer wall thicknesses were 1 metre thick and built in a clamped polygonal system, with the floor shaved down to bedrock with no room for flexure. The lateral pressure of the grain is about two-thirds of the vertical pressure. As an example, a container with a storage capacity of up to 30 tons is expected to have the potential to withstand up to 20 tons of pressure. These major problems are factors that have hindered

the storage of grain in every era. However, the period when it posed the biggest problem was in the 2nd and 3rd centuries AD, when the size and strength of the Andriake granary increased significantly.

The structures for storing grain had to be built according to strict rules. It was important that the grain was easy to access, could be loaded and unloaded in sufficient quantities in a systematic way, and could be stored in complete safety. *Horrea*, also called *granaria*, were large grain silos and first appeared in Italy in the Early Republican period, when Rome first began to trade in grain. In order to ensure the safe transportation of grain from the ports of trade to the main ports of Rome, and to ensure their long-term storage in the ports where they were transported, the Empire built large silo warehouses called *horrea*. Two important examples of these structures that have been identified in Asia Minor and have survived to the present day are the *granarium* of Andriake and the *granarium* of Patara. The *granarium* at Andriake is not only the most intact surviving example, but also the largest among the examples in the Mediterranean with a size of 2307sqm.

The structures in Myra and Patara, called Hadrian's *Horrea* were primarily built to facilitate the needs of the Empire and are distinguished by their unusual design, along with their inscriptions, which are in Latin rather than Greek, the dominant language in the region (Boatwright 2000: 123).

With increasing Roman domination, a very rapid architectural and urban development is observed in Lycian cities (Ercan 2018: 402). *Horrea* structures, which would meet urban needs, were built simultaneously in Andriake and Patara harbours in AD 128 on the orders of Emperor Hadrian. The inscription on the facades of the buildings provides information about the date of construction. This inscription confirms that Hadrian visited Lycia in AD 129 and that the construction of the *granarium* in Andriake was by personal imperial order (Aygün 2018: 167).

Location of Andriake

Andriake (Çevik 2010; 2015; 2017; Çevik *et al.* 2014; Çevik-Bulut 2010; Çevik-Bulut 2014), located in Çayağzı in the Demre district of Antalya, is the harbour quarter of Myra, which was a metropolis in ancient times. Andriake harbour is located 4.7km southwest of Myra. The harbour runs in a southeast-northwest direction and is between Kumdağ and Bozdağ Hills (Strabo 14 .6. 278). Especially during the reign of Hadrian, development policies among the provinces gained momentum.

The expansion of the social and commercial area in the south of Andriake harbour can be observed in the east-west direction with the construction activities that increased simultaneously within the Anatolian territories. On the docks, which are in the area closest to the open sea, there are 20-to-30-metres-long storage structures called shipsheds (Borchhardt 1975: 66).

Horrea Hadriani and Its Architecture

Excavations of the Horrea Hadriani/Granarium structure were carried out in 2009 and in the following years under the direction of the Republic of Turkey Ministry of Culture and Myra-Andriake Excavations Prof Dr N. Çevik. The building is well-preserved. During the 2009-2010 season, archaeological excavations were carried out inside the rooms and the existing soil at ground level was removed. In 2014, after restoration works, the building was repurposed as the Museum of Lycian Civilizations. Horrea Hadriani in Andriake is the largest *granarium* in the Mediterranean, measuring 2307sqm and preserved up to the roof. It is 64.24 metres long and 38.35 metres wide. The two sections at the western end are shorter than the other six sections and seem to have prevented the architecture from being divided into equal rectangular sections. The building, referred to as Horrea Hadriani in the inscription on the architrave on the north-facing façade, is a grain storehouse built by the Empire and attributed to Emperor Hadrian. The inscription dates the building to Hadrian's third Consulship. On the façade there are windowless rooms accessed from a ramp through an arched doorway. It was placed slightly backwards in order to make room for the forecourt. The eight doors on the northern façade provide entrances to the corresponding number of rooms. The sense of division on the front façade raises a question as to whether the building had two stories during its period of use.

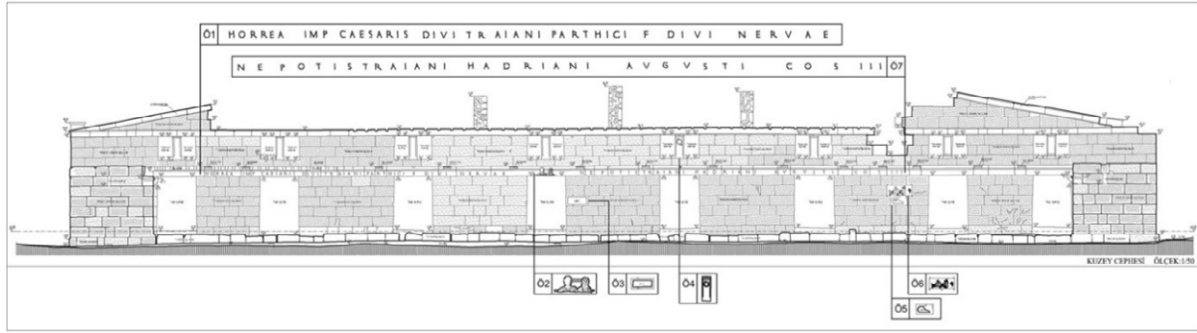


Figure 1. Horrea Hadriani front façade sketch (After Öztürk 2022).

However, as a result of the examination of the interior fittings of the building, the presence of dowel holes suggests that a shelf system may have been used rather than a second floor. Based on these assumptions, it can be concluded that the *horrea* in Patara was built in the same way and in a single type, and that they were single-story buildings. The Horrea Hadriani/*granarium* in Andriake, the harbour of Myra, referred to as the Asiatic Horrea is similar in general appearance and floor plan to the *horrea* in the neighboring city of Patara. However, when examined more closely, differences can also be identified (Rickman 1970: 138-9). The *horrea* in Myra is 65 metres long and the depth of its 6 rooms is 32 metres, while the depth of the last two rooms in the west is 27 metres, like the *horrea* in Patara. The room floors of the Horrea Hadriani structure are generally destroyed down to the bedrock. According to the data observed in room G1, where the most intact floor was found, the floor was made by backfilling onto the bedrock, which was not leveled much, but the excess protrusions were removed. Lime mortar was used to create a floor base in the hollow areas and covered with brick slabs. It is understood that this floor

was renewed many times over centuries of use. A building material unique to Andriake, murex mortar, consisting of a mixture of seashell and lime, was used (Aygün 2011: 54). The abundant amount of broken murex waste left behind as a result of the production of dyes in the workshops was utilised as a strong adhesive mortar material.

During the 2009 excavations (Table 1), surface investigations of the area revealed a wall line running from the south-east wall line of the first room G1 to the west. As was later found out, during the first construction phase, the building was not 27 metres long like G7 and G8, but it was increased to 32 metres in order to increase its storage capacity, i.e. the layout planned during the construction phase was abandoned, as can be seen on the survey plans of the building. There are two small rooms on the north façade, at the east and west corners of the building. Of these, the room in the west is labeled G9. It measures 3.72 x 3.53m internally, while the room located to the east is named G10 and measures 3.73 x 3.59m. The north-facing wall has crenellated windows in a high position. The window openings in the façade provide light for the rooms. The fact that *horrea* buildings have separate rooms in this style may be related to their function and administrative purpose. In this way, it can be assumed that these two rooms were guard rooms belonging to the *horrearii* officials and that they played an important role in making the *horrea* more secure during the period when the harbour was Emperion.

LOCATION	ENTRANCE OF THE HORREA	INSCRIPTION	MEASUREMENTS	ROOM NUMBER	FUNCTION	SLAVE IN CHARGE OF THE HORREA
ANDRIAKE	SOUTH	+	27 X 32 X 65 m.	8	TEMPORARY STORAGE	+
PATARA	WEST	+	67 X 27 m.	8	TEMPORARY STORAGE	?
OSTIA	SOUTH EAST	+	36.50 X 27.00 m.		PERMANENT STORAGE	+

Table 1. Comparison of the *horrea*.

The points where the entry and exit of goods were controlled should be noted; they are located on both sides of the building. On the jambs, thresholds and lintels of the doors, there are slots carved in a regular quadrangular form for wooden frames. It is understood that the doors have two wings. Between the sections, near the front (north) side, there are interior doors providing passage in the east-west direction. These have a width of 1.20 - 1.33m. Although the doors were locked and closed from the outside, it is still possible to see that communication between the interior spaces continues between them through the doors between the interior rooms. The windows, located on the front (north) façade,



Figure 3. Horrea Hadriani aerial view from Andriake Harbour (Myra and Andriake Excavations Archive, 2009).

The wall layout and lateral walls on the north (front) façade have a regular and pseudo-isodomic layout, while the south wall and the interior walls dividing the spaces have a polygonal layout. The façade of the building with quality isodomic stonework has a two-story layout from the exterior (Figure 3). In this case, there are entrance doors to the storage sections on the lower floor and twin windows above them on the second-floor level. On the upper side, the profile along the front and side facades presents eaves, into which the wooden beams of the roof were extended. On top of the wide eaves, the roof system would have been covered with tiles to protect the grain stores from heat and moisture. This made it easier for the hot air to flow in and out.

Building Inscription

The undamaged building inscription (architectural inscription) extending along the entire molding gives us information about the founder and the time of construction: HORREA IMP. CAESARIS DIVI TRAIANI PARTHICI F. DIVI NERVAE NEPOTIS TRAIANI HADRIANI AUGUSTI COS. III.

Based on the inscription and the busts of Emperor Hadrian and his wife Sabina at the entrance, construction coincided with the third consulship of Emperor Hadrian (AD 129).

Weights and Measures Inscription

On the east side of the door of room G5 is a decree dated between AD 388 and 392, which contains regulations regarding the control units for weights and measures to be sent to Myra and Arneai. This second inscription is located to the right of the fourth door from the east on the north (front) façade. It bears the name of Flavius Eutolmius Tatianus. It is known that this person was a local Sidymaite and the Praefectus Praetorio Orientis. The inscription mentions the weight standards that were sent to Lycia, while also describing the measurements to be used in the *horrea*.

The mention of nearby cities such as Myra and Arneai is evidence that the *horrea* was served not only Andriake but also inland centers. The fact that it is dated to AD 388-392 is of great importance, as it shows that the Horrea Hadriani was also in use in the later period. The same text refers to the contractor who rented and was responsible for the entire warehouse as the *horrearius*. The latter may lease all or part of the warehouse to private persons, or conductors (Cavalier 2007: 64). G. Rickman cites several other occurrences of the term *horrearius* in legal texts. The term also appears in Heracleon's inscription on the *horrea* wall of Andriake. Another inscription, this time a funerary stele from Andriakè, also mentions a *horrearius*, an imperial freedman. Thus, even if it cannot be proved, there is nothing to prevent the imperial warehouses from being rented out to store household goods before they are sold or after they have been acquired by wholesalers.

Reliefs of Hadrian and Sabina

According to the first investigations, the reliefs of Emperor Hadrian and his wife Sabina were found on the façade of the building. According to P.J. Trombetta, 'the female figure next to the portrait of Hadrianus may belong to Faustina, not Sabina' (Trombetta and Cherniot 1993: 99-100). This second journey of the Emperor to Asia Minor started with his being honored as Zeus Olmpios in Athens. The empress Sabina, who was elevated to the rank of Augusta in AD 128 and often accompanied Hadrian on his inspection trips, was integrated into the imperial imagery in AD 130, as is attested by her hairstyle.

Heracleon Dream Relief

Above the façade, there is a relief of Isis and Serapis, and a relief of Pluto. There is information about a *horreairius* who was a freed imperial slave of Heracleon.

Comparanda

With the simultaneous construction of the *horrea* structures in Andriake and Patara, both harbours attained imperial status. Due to the location of the two harbours, their functions should also be evaluated. For this purpose, the direction of their front facades facing the harbour entrance can give us clues about how loading and unloading operations were carried out. The Xanthe River for Patara and the Andrakos River for Andriake are of great importance (Cavalier 2007: 52). Therefore, it can be assumed that Patara and Andriake played the role of regional markets where goods to be exported from inland regions and goods imported from other regions were exchanged and transported by coastal shipping or deep-sea navigation (Cavalier 2007: 64). The Horrea Hadriani structure at Andriake is located in the commercial center of the port. The main road route and axis starts from the east and continues to the west. The Horrea Hadriani structure in Patara was not built in the commercial harbour of the period. On the contrary, it was built next to the Stadium structure, which was located on the

opposite shore from the harbour, apart from the harbour structures and public buildings, which probably did not exist at that time, and the common cemetery structures.

The two *horrea* in Italy from Hadrian's reign and later which would be most appropriate for comparison are located in Ostia, the port city of Rome. Both are *horrea* structures belonging to the Empire, intended for the storage of grain resulting from eastern Mediterranean and/or Mediterranean trade from centers such as Egypt, North Africa or Sicily, and all feature dedicatory inscriptions. The Horrea Ephagithiana et Epaphroditiana, found in Ostia, is the only building in the city that is clearly identified as a *horreum* by an inscription on a marble slab in the architrave of the main entrance (CIL XIV Suppl. 4709). It is likely to have been an export-import firm run by Epagathus and Epaphroditus, two imperial freedmen. An earlier example of the same type of building used for the same purpose was the Magasin des Colonnes. This building is located on the harbour front at Delos (BCH XXIX 1905: 22.) Both buildings were operated by slaves freed by the Roman Empire. The presence of freed slaves, who appear as *horrearii* officials, in both Andriake and Ostia may be an indication of the connection with Ostia, the main port of the Empire, and the importance given to Andriake within the borders of the province of Asia Minor, Lycia.

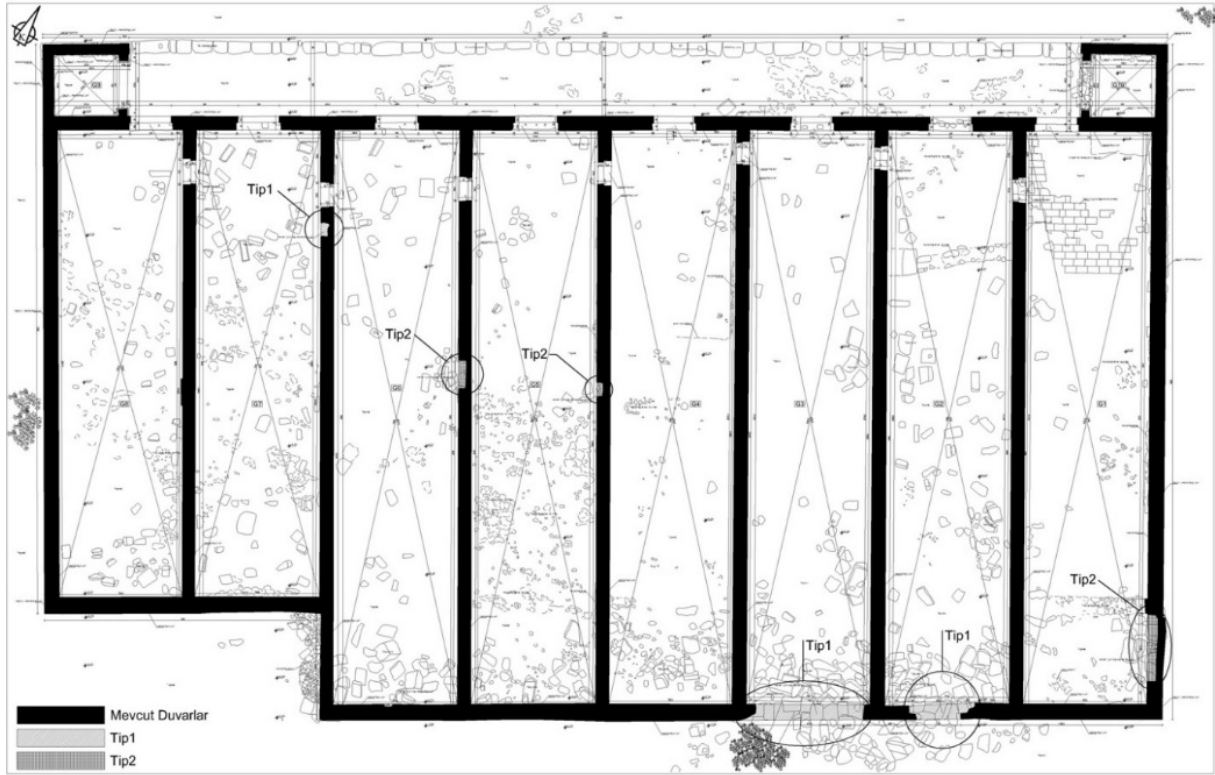


Figure 4. Horrea Hadriani Ground Plan (Myra and Andriake Excavations Archive, 2022).

Conclusion

To sum up, we have seen that the Andriake Horrea was simplified to a basic level as a row of rooms side by side. However, it should be noted that the depth of the structure in Lycia is greater than the *horrea* examples found in Italy. Compared to the Lycian lengths of 27 metres and 32 metres, the Italian length is 15 metres. Another feature of the Ostia horrea is that the rear walls of the buildings were left with slit-shaped openings to ensure good ventilation. The Horrea Hadriani building at Andriake has such ventilation openings on the upper levels of the lateral walls on the east and west. When these data are taken into consideration, Cavalier's thesis that 'there are no slit-shaped openings in the walls of the two Horreum structures in Lycia' can be refuted. In this case, an evaluation can be made according to the location and urbanism in the harbour. The absence of openings in the rear walls and the presence of these openings in the lateral walls may constitute data for comparison (Cavalier 2007: 55-60.) The Horrea Hadriani/Granarium structure located in Andriake, the harbour of Myra, has been analysed in terms of architecture, typology, location, construction techniques, architectural techniques and interior architecture. While making architectural descriptions, the survey plans and measurements of Horrea Hadriani before it was transformed into the 'Museum of Lycian Civilizations' were taken into consideration.

We have endeavoured to inform the reader about the purpose of these grain stores before defining them. In line with Mediterranean trade, the concept of the *annona* and the Lycian Customs Inscription, a brief introduction was given to the routes, duration and goods carried by the sea trade. Since the concept of the *annona* is a very wide-ranging subject, we have tried to define it in a way that does not go into detail but at the same time provides the reader with explanatory historical information and the concepts it contains.

Last but not least, the aim of this research is to ask questions such as which products were stored in the *horrea*? How they were stored? What was their interior architectural layout like? For what purpose were such buildings built? What areas of the city and its surroundings were chosen for their location? At the same time an attempt was made to illuminate the social, economic, cultural and belief values of the society, which were partially obscured. The institutionalization of storage implies the existence of centralized and large-scale granaries and much more complex socio-political organizations such as chiefdoms and states. As part of the grain trade, it should not be forgotten that storage functions were part of the communication network. Among the results of the socio-economic, cultural and archaeological dimensions of the *Horrea Hadriani* in Andriake, the population gradually increased as a result of the growth in maritime trade in the ports where these structures were located and the popularity of safe grain and material storage in the structures. It is understood from archaeological and scientific data that with the population increase in Andriake, baths, religious and commercial structures increased around the harbour and *horrea* structures. Although there is no extant written data showing the socio-economic development in Andriake, the impact of the presence of the *horrea* structure is clearly understood from the archaeological findings alone. From functional structures to permanent structures, it is certain that it had positive effects on trade and socio-economic development (Brant and

Kolb 2007: 101). The economic dynamism of the Lycian coast, which is observed since the Hellenistic period and was perhaps encouraged by the emperor Hadrian, was preserved. After all, storage is a mechanism for production.

By the 1st century AD, warehouses at Andriake, as at Ostia, were defined as imperial property. Divergent practices regarding ownership, the leasing of warehouses, or the creation of contractual sub-tenants did not change the operational systems of warehouses and the organization of storage forms (Oyen 2020: 131). In the end, storage was used by the empire as an effective tool for the control of human life. In particular, the linkages between grain storage and taxation systems, regional control mechanisms and legal regulations were able to control human life and future sustainance. As a result, storage affected not only social and economic, but also cultural, psychological, and moral values.

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Iconography, Symbolism and Small Finds

Birds on Mosaic Floors in the Southern Levant: Evidence of Mediterranean Cultural Transmission over the Generations

Lihi Habas¹

Abstract

In the iconography of Byzantine mosaic floors in the southern Levant, a variety of birds, fowls, and waterfowl are depicted. They appear in churches, synagogues, and burial chapels. The Byzantine depiction continues the tradition of Roman art. There are floors where the birds are the only decoration, and the different species resemble a sort of scientific ornithological catalogue. It appears that these were taken from ancient Hellenistic-Roman illustrated scientific manuscripts. On other floors the depiction of the birds is combined with scenes from daily life such as the vintage, the hunt, and animal pursuits.

The depiction of the Byzantine bird hunt is a visual illustration of the ancient classical and Roman sources discussing the variety of methods of bird hunting. Sometimes the birds are integrated into floors in which clearly religious symbols appear, such as the cross and the seven-branched menorah. Furthermore, within the composition certain motifs are emphasised in the centre (the pair of peacocks, the eagle, and the bird in the cage) which in part allude to everyday life, while in another aspect are understood as symbols expressing the resurrection and salvation - symbols that originated in classical and Roman iconography and which were transferred to the Jewish and Christian worlds, each religion giving these motifs their own symbolic meaning. Thus, the depiction of the birds is evidence of cultural transmission across the Mediterranean throughout the ages.

Introduction

In the iconography of Byzantine mosaic floors in the southern Levant, a variety of birds, fowls, waterfowls, poultry and bird hunts are depicted. They appear in a secular context and in a religious context in churches, burial chapels, and synagogues. This discussion will focus on Israel and Transjordan (the Holy Land). Depictions of birds appear in a variety of compositions - alone; as a kind of catalogue; alongside different motifs; bird hunting in depictions of everyday life; alongside motifs with religious symbolism; and also in Nilotic depictions, but this goes beyond the scope of this discussion.²

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² The figures from Transjordan courtesy of Michele Piccirillo, Studium Biblicum Franciscanum (SBF) and Ryder Kouba, the American Center of Oriental Research (ACOR), Amman. The figures from Israel courtesy of Natali

Birds and Winged Creatures in Mosaic Floors

In the archaeological excavations conducted in Israel and Transjordan, many mosaic floors were discovered in which different and diverse species of birds are depicted. In Jerusalem two floors with Armenian inscriptions were discovered, with depictions of a variety of birds: in the St. John Chapel on the Mount of Olives (5th century or beginning of the 6th century AD), the birds and winged creatures are set in a composition of interlaces of circles and squares (Narkiss 1979: 24, Figs. 36–37); and on the mosaic floor known as the ‘Bird Mosaic’ or the ‘Armenian Mosaic’ (Figure 1) that decorated the funerary chapel from the Musrara neighbourhood (mid-6th century AD) the birds are set among vine scrolls emerging from an amphora, with a pair of peacocks on either side. In the scrolls are variety of winged creatures, with a clear differentiation between the different species and their characteristics, such as body structure, and shape of beak and legs. The mosaic shows roosters, doves, peacocks, an eagle, and waterfowl. In the apse, a goblet with fruit is depicted on a background of flowers, on either side of it a pair of birds in heraldic array, and in the upper part another pair of birds (Amit *et al.* 2021: 119–21, Fig. 1; Narkiss 1979: 28, Figs. 39–40; Schick and Bliss 1894: 257–61, Figs. on pp. 258–9). One hundred and twenty different types of birds are depicted in an interlace of circles on the floor of the central courtyard in the *villa suburbana* in Caesarea Maritima (Patrìch 2015: 134, Fig. 173d; Talgam 2014: 346–7, Figs. 424–426), and on a floor in the chapel at Kyria Maria Monastery (AD 567) in Beth Shean (Scythopolis) (Fitzgerald 1939: 8, Pls. XIV, XV.2–3).

The Byzantine depiction of bird types continues the tradition of Roman art, as in the birds perched on branches in the Roman Villa at Lod in Israel (Talgam 2015: 67, Fig. 47); and also in the ‘House of the Red Pavement’ at Antioch (Cimok 2000: 86–7), and in the frame of the myth of the Seduction of Antiope in the ‘House of Poseidon’ at Zeugma (Önal 2009: 50, Figs. on pp. 51, 53) – both from Turkey. The different species somewhat resemble an ornithological catalogue. It appears that they were taken from ancient Hellenistic-Roman illustrated scientific manuscripts, an echo of the classical tradition of scientific illustrations, such as in the ornithological treatise of Dionysius of Philadelphia (?) – an illustrated treatise of bird species that also included instructions for hunting birds. Some of the birds do not appear in the text, so it is assumed that these illustrations derive from earlier illustrated essays, attributed by some researchers to Alexander of Myndus (1st century AD), who wrote ‘On Animals’ (Κτηνῶν), and ‘On Birds’ (Περὶ Πτηνῶν), and whose works, now lost, are preserved as fragments in later authors as Athenaeus and Aelian. A kind of scientific ornithological catalogue of different types of birds and waterfowl survives in a late copy (14th century AD) – the Vienna Dioscurides, now in Vienna Nationalbibliothek (Weitzmann 1977: 71, Pl. 20).³

On other floors found in Israel, the depiction of the birds is combined with scenes from daily life, such as the vintage in the chapel of the monastery in Sede Nahum (Habas 2022: 223–6, Figs. 5–9); animal

Bashukevich, Visual Archives of the *Israel Antiquities Authority* (IAA). My deepest gratitude for pictures and cooperation.

³ Vienna Nationalbibliothek, cod. Med. Gr. 1, fol. 483v.

pursuits in the synagogue in Gaza Maritima (AD 508/9; Magen 2010: 106, Fig. on p. 108; Ovadia 1968: 124-125, Pl. III); and vintage, hunting and chasing in the upper floor of the Funerary Chapel at el Hammām in Beth Shean (Scythopolis; Avi-Yonah 1936: 13-9, Pls. XIV-XV, XVI.2; Talgam 2014: Figs. 116, 229-231).



Figure 1. The 'Armenian Mosaic', funerary chapel from Jerusalem (Photo by the Author, courtesy of IAA).

Sometimes the birds are integrated into floors in which clearly religious symbols appear, such as the seven-branched menorah, citrons, ram's horn, and a pair of lions in the synagogue of Ma'on-Nirim (Avi-Yonah 1960: 25-32, Fig. 13, Pls. III-VIII); or sacred Christian symbols, as in the apse of the chapel at Khirbet Beit Sila that is adorned with a complex composition consisting of various kinds of birds, an

amphora, and fish in interlacing medallions (Batz 2002: 43–5, Figs. 5–6; Magen 2010: 202–9). The fish symbolises Jesus: the motif of the fish (ΙΧΘΥΣ) can be interpreted as a hidden symbol of Christ, Ι(ησοῦς) Χ(ριστός) Θ(εοῦ) Υ(ἰός) Σ(ωτήρ), an acronym for Jesus Christ, Son of God, Saviour (Avi-Yonah 1940: 73), and also as a symbol of Christian souls, divine providence, and blessed life on earth (Habas 2005: I: 297–8). Depiction of the fish together with the amphora that symbolises the wine expresses the sacrament of the Eucharist that takes place at the nearby altar table.

Bird Hunting

In addition, bird hunting is depicted in mosaic floors more frequently than depictions of other hunts, in both a secular and a religious context (Habas 2005: I: 240–2; Hachlili 2009: 175). These depictions testify to the diverse methods employed in hunting birds. Some present a rich narrative story, and some choose a single episode. The episodes are scattered in different areas throughout the building, most frequently incorporated on a vegetal background, within carpets and frames of vine and acanthus scrolls, and between trees, but also in frames and carpets of geometric and free composition.



Figure 2. The church near the Winged Lions Temple in Petra: southern aisle, on the left; northern aisle, on the right (Courtesy of ACOR, Amman).

A common depiction shows hunting birds using reeds with sticky lime: the branches were beaten with sticks to scare the birds, as shown in the apse of the Church of the Holy Martyrs (al-Khadir) in Madaba. The frightened birds flew straight to the limed reeds, where their wings stuck to the reeds, and a net

was to hand to catch them and put them into the hunter's cage. Despite the iconoclastic destruction, in the nave it is possible to identify the branches being shaken with a stick and the scaring of the birds, while nearby a man with limed reeds is about to put a bird into the cage with the bait bird (Lux 1967: 170, 172, Figs. 31b, 37b-c; Piccirillo 1993a: 129-31, Figs. 142, 144-145, 157; 1999: Fig. on p. 19). In the southern aisle of the church near the Winged Lions Temple in Petra (Figure 2, left), the hunter is depicted with a cage on his back, holding reeds and a small vessel containing lime hanging on a stick (Piccirillo 1993a: Fig. 716; Waliszewski 2001: 229, 252-3, Pls. on pp. 309, 319). Similar depictions were discovered within the acanthus scroll frame in the church in Nahariya (Dauphin and Edelstein 1984: 60, Pl. XXVII, Plan; 1993: Plan on p. 50, Pl. II.B), in the Church of Bishop Sergius (AD 587/8) in Umm al-Rasas (Piccirillo 1993a: 234-5, Figs. 335, 366, 369; 1994: 122-34, Figs. 2-3, 6), and in the diaconicon of the monastery in Jabaliya (Humbert *et al.* 2000: 123-4). The use of a net is depicted in the hall of the Church of the Sunna' Family in Madaba, while in the vine scrolls frame is an empty cage with an open door, and a bird nearby, destroyed by the iconoclasts (Piccirillo 1993b: 283-90, Figs. 4-5, Fotos 7, 14-15, 26; 1999: Fig. on p. 203), and a similar depiction appears in the Church of Bishop Sergius in Umm al-Rasas mentioned above (Piccirillo 1994: Fig. 11).

A very common motif in the mosaic floors is the cage used in bird hunting techniques. Sometimes only an empty cage is shown, as in the Samaritan synagogue at Khirbet Samra, where figurative depictions were avoided (Magen 1993: 211-2, Fig. 25; 2010: Figs. on pp. 137, 140-1), or an empty cage with open door and the bait bird nearby, such as in the upper floor of the Baptistry Chapel of the Cathedral complex in Madaba (Figure 3) (Piccirillo 1993a: 118, Figs. 102, 119), and in the church in Nahariya (Dauphin and Edelstein 1984: 56, 59, Pls. XIXa, XXVIa). An open cage with different types of birds and winged creatures set in an acanthus scroll frame of the carpet decorated the nave of the Church of the Deacon Thomas in 'Uyun Musa Valley (Piccirillo 1998: 340, Figs. 150, 154-163, 165-169, 171, 173).



Figure 3. The upper floor of the Baptistry Chapel of the Cathedral complex in Madaba (Courtesy of M. Piccirillo, SBF).

Another method was the use of a cage, closed or open, with a female serving as bait for males, or with a very handsome male as bait, as depicted in the Chapel of Elias, Maria and Soreg in Gerasa (Piccirillo 1993a: 296, Figs. 514, 572), and in the northern aisle in the church near the Winged Lions Temple in Petra

(Figure 2, right) (Waliszewski 2001: 229, Pls. on pp. 311, 315). A cage with a bird in it is the most common depiction, as appearing in the churches in 'Anab el-Kabir (Amir 2012: 476, Fig. 43:1), Shellal (AD 561/2; Trendall 1957: 20, Figs. 3, 4d, Pls. I-II), Ḥorvat Be'er-shem'a (Gazit and Lender 1993: 274-6, Fig. on p. 273, Pl. XXI:E), Khirbat 'Asida (Baramki and Avi-Yonah 1934: 18), the 'Armenian mosaic' in Jerusalem (Schick and Bliss 1894: 257-61), and the synagogues of Ma'on-Nirim, and Gaza Maritima (Hachlili 2009: 140-141, Pl. VI.13). This motif also appears in churches in Syria, Lebanon, North Africa and Corfu (Habas 2005: I: 251-2, with sites and references there).

The use of a trained falcon in hunting appears only once, in the Hippolytus Hall in Madaba (Figure 4) (Piccirillo 1993a: 66, Fig. 3), in a depiction of the tragedy of Phaedra and Hippolytus known from the literary compositions of Euripides in Greek, and Seneca in Latin. The falconer holds a falcon on his gloved left arm, and his appearance in the mosaic is explained as part of Hippolytus' preparations for setting out to hunt.⁴ It is worth noting that Procopius of Gaza (c. AD 465-528) wrote that a falconer also appears on the wall of the church of Gaza (Johannes of Gaza, *Ekphrasis*, 1. 250-260).



Figure 4. The Hippolytus Hall in Madaba (Courtesy of M. Piccirillo, SBF).

⁴ Some researchers wonder if the large bird standing on the hunter's shoulders in the church at Petra, or the large bird standing on a cage in Jabaliyah can be identified as a falcon. But the depiction in these two churches is not clear, and since falcon hunting is depicted differently, and the hunter's arm is not covered with a glove, these depictions have not been included in the discussion.

Farmyard poultry is also depicted: within the acanthus scroll frames of the nave carpets, such as the hen in the church in Nahariya (Dauphin and Edelstein 1984: 64, Pl. XXXVI), and the hen and chicks in the Church of the Apostles (AD 578) in Madaba (Lux 1968: 110, Tafel 18:b; Piccirillo 1993a: 106, Figs. 81, 85), and in the synagogue of Beth Alpha (Suknik 1932: 42, Figs. 20-25). A hen surrounded by chicks appears in the vine scrolls of the nave of church of Bishop John at Ḥorvat Baraqa–Gan Yavne (AD 511) (Habas 2012: 132, Fig. 8; 2016: 94, 119, 129, Fig. 14). An egg-laying hen appears in the vine scrolls of the nave of the synagogue at Maʿon-Nirim (Figure 5) (Avi-Yonah 1960: 29, Fig. 13, Pl. VI.3).



Figure 5. The synagogue at Maʿon (Nirim) (Photo by the Author, courtesy of IAA).

The Byzantine depictions of birds and bird hunting follow on from the Roman iconography and hunting techniques described in Greek and Roman sources. Bird hunting (*aucupium*) was indeed a feature of the leisure life (*otium*) of the Roman aristocracy, but also provided a supply of food. A variety of birds and fowl are depicted in art as part of the *xenia*, in wall paintings such as the *pinakes* with rooster and fruit in the *oecus* of ‘Casa del Criptoportico’ (I, 6, 2-4) and the painting ‘The victory of the fighting chicken’ in the *ala* of ‘Casa dei Vettii’ (VI, 15, 1) in Pompeii; the rooster, hen and fruit near an altar, and rooster, partridge and grapes in Herculaneum; and a rooster eating mushrooms spilled from an upside-down woven basket and a bird pecking at pears in the villa of Poppea at Oplontis (De Caro 2001: 49, 81-3, 86-90, Figs. 15, 69-70, 74, 77, 81-82). Other examples of birds as part of the *xenia* include the depictions of three dead birds hanging from a nail in Pompeii (De Caro 1999: 44, Fig. 9), and the dead capon, partridge, hare, thrushes, chickens and moray eels hanging or placed on a shelf, from the ‘House of the Deer’ (IV, 21) in Herculaneum (De Caro 1999: 51-3, Figs. 19-20; 2001: 73-5, Figs. 51-54). Depictions of the *xenia* also appear in the mosaic floors of North Africa (3rd century AD), such as live roosters in ‘The Lobster House’ in Acholla (Gozlan 1990: 35, Fig. 24, Planche VIII.1-2), and live birds and fowl in the Odeon Hill in Carthage (Ben Osman 1990: 48, Planche XI.3-4) in Tunisia; or birds and fowl hanging after the hunt, such

as thrushes on a string in Thyrdrus (El Djem), now in the Bardo Museum (Ennaïfer 1996a: 72, Fig. 36), and species of birds and fowls hanging after the hunt in the frame of carpet with a depiction of hunting in the high mountains of Tunis in the 'House of Asklepieia' in Althiburos (Ennaïfer 1990: 23–4, Planche III.3; 1996b: 177–9, Figs. 126a–b, 132).

In the Roman calendar, bird hunting was among the typical labours of December, as appears in the mosaic of the months in Carthage. December is depicted as a bird hunter, holding a rope in his right hand, from which hang birds that have just been hunted, rods, and a cage for the birds resting on his shoulder. In the Calendar of 354 (Peiresc copy and Vienna copy), the birds hang on a rope hanging on the wall. Moreover, the bird in the cage appears at the feet of the month of July (Åkerström-Hougen 1974: 125, Figs. 80, 84; Stern 1953: 283–8, Pls. IX.4, XIII.1, XIX.2, XLII.1). The Byzantine depictions of farmyard poultry follow on from Roman iconography as well. A hen with chicks around her is depicted as one of the motifs in a geometric net composition in a villa in Lod, Israel (Talgam 2015: 55, Figs. 30–31, 39).

Classical and Roman Sources on Bird Hunting

The Roman poet Martial (1st century AD), in his *Epigrams*, describes with great humour the use of birds in Roman cuisine. On partridges: 'This bird is very rarity served on Italian tables: one often sees it playing in the fishpond.' (13. 65); on thrush: 'Amongst birds the fieldfare (thrush), if my judgment can aught decide, amongst quadrupeds the primmest delicacy is a hare.' (13. 92); on woodcock: 'Whether I am woodcock or partridge, what does it matter if the flavour be the same? A partridge is dearer, thus it has better flavour.' (13. 76); on ducks: 'Let a duck certainly be served up whole; but it is tasty only in the breast and neck: the rest return to the cook.' (13. 52); on fowls: 'If I possessed guineafowls and pheasants you should receive them; but now receive the birds of the farmyard.' (13. 45); on heathcocks: 'Of all flavours of fowls the most tasty is said to be that of Ionian heathcocks' (13. 61). The *xenia* continued to be a common iconographic motif in Byzantine mosaics as well.

As mentioned before, the Byzantine depictions of birds and the bird hunt also follow the Roman iconography, which was a visual illustration of the ancient texts discussing the variety of methods of bird hunting. The use of limed reeds and nets in the bird hunt appears in mosaics, such as scenes from rural life from Oudna (3rd century AD), now displayed in the Bardo Museum (Ennaïfer 1996b: 178, Fig. 125), and in the hall of the 'Little Hunt' in Piazza Armerina (4th century AD), with a falcon (Giovanni 1997: 26, Fig. on p. 25). Oppian (late 2nd century AD) wrote: 'And those who prepare destruction for birds, easy for them too and visible is their prey. For some they capture unawares asleep upon their nests; others they take with limed reeds; others fall of themselves into the fine-plaited nets, seeking for a bed, and a woeful roost they find.' (*Halieutica*, 1. 32–33); 'Yea and to the fowler his toil is sweet; for to their hunt the fowlers carry nor sword nor bill nor brazen spear, but the Hawk is their attendant when they travel to the woods, and the long cords and the clammy yellow birdlime and the reeds that tread

an airy path.’ (*Cynegetica*, 1. 63-65). Martial wrote in his *Epigrams*: ‘The yellow-bird (woodpecker) is beguiled by canes and nets...’ (13. 68).

The use of net and trap appears in scenes from rural life from Oudna, as mentioned above, and in hunting scenes in Kelibia, also displayed in the Bardo Museum (Ennaïfer 1996b: Fig. 129), as in Oppian’s description of how the hunter takes advantage of bird’s desire for food: ‘As when a man, devising a snare for lightsome birds, sprinkles some grains of wheat before the gates of guile while others he puts inside, and props up the trap; the keen desire of food draws the eager birds and they pass within and no more return or escape prepared for them, but they win an evil end to their banquet’ (*Halieutica*, 2. 96-103). The decoy bird method was often used in bird hunting (Nemesianus, *De aucupio*, 1-28). An owl is used as a decoy for birds in the mosaic of Oderzo (Treviso) (2nd or 3rd century AD): the owl is used to scare the birds, then they are captured by the limed reeds (Åkerström-Hougen 1974: 93, Fig. 46).

Sometimes the hunt involved using a female as bait, inside or outside the cage, so that lust for the female led the males into the trap, as Oppian wrote: ‘but they find a hateful issue to their desires. Even as one who devises a guileful doom for birds hides in a dense thicket a female bird, his tame companion in hunting birds of the same cry; and she shrilly pipes her sweet song, and the birds, hearing, all hasten towards her and rush of themselves into the snare, misled by the call of the female cry’ (*Halieutica*, 4. 120-126).

Xenophon (born c. 430 BC) also wrote: ‘And others again are victims of amorous heat, as quails, for instance, or partridges, which, at the cry of the hen-bird, with lust and expectation of such joys grow wild, and lose their power of computing dangers: on they rush, and fall into the snare of the hunter?’ (*Memorabilia*, 2, 1. 4).

The decoy bird was mainly used in pigeon hunting. During the spring courtship season, a handsome male was put into the cage to provoke the males to fight, and then they would capture the females. The hunters used the birds’ lustful instinct to capture them, as described by Pliny (AD 23/4-79): ‘They are also captured owing to the fighting instinct caused by the same lust, as the leader of the whole flock sallies out to battle against the fowler’s decoy, and when he has been caught number two advances, and so on one after another in succession. Again about breeding time the hens are caught when they sally out against the fowlers’ hen to hustle and drive her away. And in no other creature is concupiscence so active. If the hens stand facing the cocks, they become pregnant by the afflatus that passes out from them, while if they open their beaks and put out their tongue at that time, they are sexually excited. Even the draught of air from cocks flying over them, and often merely the sound of a cock crowing, makes them conceive’ (Plinius Secundus, *Naturalis Historia*, 10, 51. 101-102).

Lastly, a trained hawk/falcon was used in bird hunting. This method originated in the east, and the taming of the falcon occurred around 500 BC and is known also in the Greek and Roman sources, as described by Aristotle (384-322 BC): ‘In Thrace men hunt for little birds in the marshes with the aid of hawks. The men with sticks in their hands go beating at the reeds and brushwood to frighten the birds out, and the hawks show themselves overhead and frighten them down. The men then strike them with

their sticks and capture them. They give a portion of their booty to the hawks; that is, they throw some of the birds up in the air, and the hawks catch them' (*Historia Animalium*, 9. 36).

Pliny also wrote about it: 'In the district of Thrace inland from Amphipolis men and hawks have a sort of partnership for fowling: the men put up the birds from woods, and reed-beds and the hawks flying overhead drive them down again; the fowlers share the bag with the hawks. It is reported that when the birds have been put up the hawks intercept them in the air, and when it is time for a catch invite the sportsmen to take the opportunity by their screaming and their way of flying' (*Naturalis Historia*, 10. 10). Aelian (AD 165/70-230/5) also wrote: 'Falcons are excellent at fowling and are no whit inferior to eagles: they are by nature the tamest of birds and the most attached to man; in size they are as large as eagles. And I am told that in Thrace they even join with men in the pursuit of marsh-fowl. And this is how they do it. The men spread their nets and keep still while the falcons fly over them and scare the fowl and drive them into the circle of nets. For this the Thracians allot a portion of their catch to the falcons and find them trusty; if they do not do so, they at once deprive themselves of helpers' (*De Natura Animalium*, 2. 42; Åkerström-Hougen 1974: 92).

Visual depictions are known from the Late Roman and Byzantine periods. The image of the falconer, his arm covered by a glove, who hunts animals with the help of a falcon, appears in the context of hunting depictions in North African mosaics between the 4th and 6th centuries AD: in the house of 'Chariot of Venus' (4th century AD) at Thurburbo Maius, a rabbit is shown struggling while caught in the claws of falcon, released by the hunter on horseback. Similar scenes have been discovered in Hergla, Tabarka, and in Kelibia mentioned above (Ennaïfer 1996b: 182: Figs. 129, 131); in Carthage (Bordj-Djedid; 5th century AD) a net is stretched between two trees, and behind it a rider and his dogs are pursuing hares, while a falcon swoops down upon another (Dunbabin 1978: 59, 251, Pl. XIX.42-43). A narrative description of falcon hunting appears in the 'Falconer Villa' (5th or early 6th century AD) in Argos, Greece: there are depictions of the preparations and going hunting, the falcon hunting a duck, the pursuit of a hare, and the return from the hunt. The falconer is depicted with a glove on one arm, and with leather straps tied to the falcon's legs (Åkerström-Hougen 1974: 28-32, 71, 86, 91, Figs. 12:1-2, 13:1-2, Pl. III).

Despite the similarities between the Byzantine and the Roman hunting scenes, one major difference should be noted: while the Roman hunting scenes are depicted as part of the nature in which they take place, in the Byzantine period, hunting episodes are detached from their natural context, embedded in geometric and vegetable nets and depicted on a neutral white background.

Conclusion

In conclusion, this article has reviewed the mosaic floors from Israel and Transjordan (the Holy Land) from the Byzantine period, including depictions of types of birds and winged creatures originating both from pattern books and ornithological encyclopaedias, and from the direct familiarity of the artist when depicting farmyard poultry. The article also discussed the different bird hunting methods depicted on

the floors that reflect everyday life (shaking the branches of the tree with sticks to scare the birds, using reeds with sticky lime, using a net, use of a closed or open cage with a bait bird nearby or within, and using a trained falcon in bird hunting).

The Byzantine iconography originates in the Roman iconography that served as a visual illustration of the hunting methods used in Greek and Roman times, as recorded in the ancient sources. Thus, the depictions of birds and bird hunting are evidence of cultural transmission across the Mediterranean throughout the ages.

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Archaic and Classical Lamps from Sinop Museum¹

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Abstract

The ancient city of Sinope is located on the Sinop Headland, the northernmost point of Anatolia, in the center of the southern Black Sea coastal strip. It is stated in the ancient sources that Sinope was established as a colony of Miletos in the later 8th century BC. After the Lydians defeated the Cimmerians, Miletus attempted to establish its colonies and Sinope was re-established by the Miletians after the middle of the 7th century BC. Then, in the Hellenistic Period, Sinope was also affected by the intense hellenization that started with the campaigns of Alexander the Great, and first Antigonos and then Seleukos dominated the region. Sinope, which was included in the territory of the Kingdom of Pontus, founded by Mithridates in 183 BC, has been settled continuously since the Archaic Period.

There are lamps belonging to the Archaic, Classical, Hellenistic, Roman and Byzantine Periods in the collection of Sinop Museum. Most of them have been purchased or confiscated, as well as coming from scientific archaeological excavations. In this study, we will attempt to showcase the Archaic and Classical Period lamps and their origins. The earliest example among them is an open oil lamp which is probably dated to the last quarter of the 7th century BC. The following examples are dated to the Archaic Period, show a profile with an open body and a bridged nozzle. These lamps are dated between the second half of the 6th century BC and 480 BC, according to the Attic chronology. Sinope examples are also similar to the Ephesian finds which are dated to the last quarter of the 7th century BC, and this date coincides with the colonization date of Sinope.

Introduction

Sinope ancient city (modern name Sinop) is located on the Sinop Headland, the northernmost point of Anatolia, in the center of the southern Black Sea coastal strip. Sinope owes its natural harbour to be the most important stop of the east-west strait in the southern shoreline of the Black Sea, which has a challenging geography. Being almost directly across from the Crimean Peninsula enables Sinop to play a significant role in transportation and trade between the Crimean Peninsula and Anatolia. Also, the connection with Central Anatolia makes Sinope one of the important cities of Paphlagonia region.

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Although Sinope is geographically a port city of the Black Sea, its finds reflect its Mediterranean character intensely because it was a Greek colony. It is stated in ancient sources that Sinope was established as a colony of Miletos in the late 8th century BC. Accordingly, Sinope was among the first colonies in the first colonization period of the Milesians between 725-700 BC. The finds obtained from small-scale excavations by E. Akurgal and L. Budde between the years of 1951-1953 in various areas of the city revealed that Greek colonization emerged in Sinope in the third or fourth quarter of the 7th century BC (Akurgal and Budde 1956: 4-7; Akurgal 1956: 48; Budde 1956: 5; Erzen 1956: 48; Boysal 1958: 27). This inconsistency between the information obtained from ancient sources and the archeological data may be rooted in the lack of an extended excavation work in the city. Sinope continued as a settlement in the Archaic, Classical, Hellenistic and Roman periods without any interruption.

Traces of the intense relationship of Sinope with the Aegean world can be demonstrated by artifacts of ceramic and statuary obtained via several rescue excavations or acquisitions, while the city persisted as the most important industrial port on the southern shore of the Black Sea from its foundation onwards. There are lots of oil lamps belonging to the Archaic, Classical, Hellenistic, Roman and Byzantine periods in the collection of the Sinop Museum. The subject of this study is the oil lamps belonging to the Archaic and Classical Periods which are among the artefacts in the collection of Sinop Museum that have never been published before and which came to the museum through purchase or confiscation, besides a few scientific archeological excavations. In this study, the Archaic and Classical lamps will be evaluated, and commercial and cultural relations will be determined in the light of these findings. However, this subject has some difficulties in its entirety. That is to say, the artistry, namely there are intermingled local and Greek factors because of the colonization movement in Sinop. This situation pertains not only for the oil lamps but also other ceramic finds and sculpture artifacts.

Archaic and Classical Lamps in Sinop Museum

When looking at the oil lamps found in Sinope, we may note that the earliest example is an open lamp made on a wheel (Figure 1, Nr. 1; Figure 9, Nr. 1). When they first came into existence, the wicks of the lamps looked like open plates, and it took a long time before they became enclosed. This oil lamp, which has no exact parallel among the published examples, is a good example of transition. It is close to Howland Type 6A with its open body, short nozzle and unglazed shape (Howland 1958: 15-6, Nos. 38-42, Pl. 2.30).⁴ It differs from this partially glazed group with its unglazed condition.

The following examples show an open-bodied and bridged nozzle profile. The bridged nozzle open oil lamp group with pipe hanger holes is represented by two examples in Sinope (Figure 1, Nr. 2-3). Although both of these examples are similar in form, they have different undercoats.

⁴ This group has been dated to the end of the 7th century BC - the first quarter of the 6th century BC.



Figure 1.

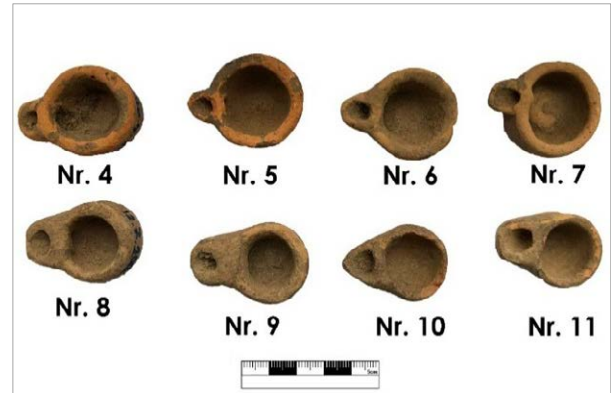


Figure 2.

Both lamps have a wheel-shaped, wide and shallow body profile. Two short, rounded nozzles were placed opposite to each other. The rim of the body with a round and flat profile curves inward sharply. The truncated cone-shaped pipe hanger hole in its core exceeds the body height. The origin of this type of oil lamp, very common in the Greek world, is considered to be Rhodes or Samos in the eastern Aegean (Howland 1958: 39). They are most commonly found in Rhodes and Lindos; Smyrna, Assos, Ephesos in Western Anatolia, Athens and Thorikos in Greece, Aigina, Argos, Melos, Olynthos, Samothrake and Thasos in the Aegean. This type of oil lamp has also been found in Southern Italy, in the Iberian Peninsula, in cities and centers such as Cyprus, Egypt, Naukratis and Tokra in Kyrenaika (Kassab-Tezgör and Sezer 1995: 52). It was found at Istros on the Black Sea coast, at Panticapaeum (Zhuravlev *et al.*: No. 10, 12, 14, 20) in Southern Russia, and as seen at Sinope on the Southern Black Sea coast. These lamps are included in Type 19 A by Howland and are dated between the second half of the 6th century BC and 480 BC (Howland 1958: 39). Sinope samples are also similar to Ephesian samples dated to the last quarter of the 7th century BC, and this date coincides with the colonization date of Sinope.

A group of wheel-made, bridge-nosed miniature votive lamps found in the city center of Sinop also belongs to the Archaic Period (Figure 2, Nr. 4-11; Figure 9 Nr. 7, 11). These oil lamps are also dated to the 6th century BC. In particular, the lower four lamps, with their slightly concave and upright body and bridged noses, show great similarities with typical Western Anatolian, especially Kaunos, votive lamps (Kassab-Tezgör and Sezer 1995: 48, Cat. No. 92; Varkıvanç 1999: Pl. 1, 2). There are two examples (Figure 3, Nr. 1-2; Figure 9, Nr. 12), which can be evaluated in the early lamp group of the Sinop museum, which can be dated between the 2nd half of the 5th century BC and the first half of the 4th century BC due to their form and the size of the filling hole. While the first (Nr.12) is similar to Howland Type 30A, the other (Nr.13) is similar to the Halicarnassus find numbered Bailey Q252 (Howland 1958: 97; Bailey 1975: 123, Pl. 42, Q252).⁵

⁵ The above numbered example is a Halicarnassus construction and was dated to the 6th century BC by Bailey in the remains of the Mausoleum structure, in terms of the context in which it was found. It differs from our example in that its nose is shorter.

Three examples (Figure 4, Nr. 14-16) belonging to the Classical Period and found in the city center of Sinope are Attic oil lamps. They have a wheel-made, flattened spherical chamber with a slightly convex or flat profile. All three have a strip-shaped handle that connects horizontally to the body, as can be seen from the broken but preserved parts. Clays range from light reddish brown to pink and contain small mica particles. Except for the bases, the inner and outer parts have a glossy black glaze. The shoulder parts of the two are slightly convex and inclined inward (Nr.14,16). The rim of the third sample is separated from the narrow shoulder by a groove (Nr.15). It is possible to come across lamps of this type, which emerged in Attica at the end of the 5th century BC, in many centers until the 3rd century BC (Howland 1958: 58, No. 228-233, Pl. 8.36).⁶ There is always a workshop problem for this widely used type: they may be highly successful imitations of Athenian types, or they can be original Athenian productions. They have also been found in Amisos in the Black Sea (Ünan 2016: 180, 184, 187, 192, 202, Cat. No. 3).⁷ Along with these examples, Sinope finds will be added to the literature.



Figure 3.



Figure 4.

Another group, the specimens dated to the first half of the 4th century BC (Figure 5, Nr. 17-19; Figure 10, Nr. 18), with their thin, matte black slips that were mostly spilled, may have been produced in a local workshop as an imitation of the Attic type, as we mentioned above (Kassab-Tezgor and Sezer 1995: 68-9, Cat. No. 160).⁸

⁶ It is possible to evaluate the first two samples within the group evaluated as Type 23C by Howland. Similar types of lamps were evaluated by Brooner in Type 6 (Brooner 1930: 43, Pl. III). Bailey dated similar lamps found in the Agora of Athena samples to the first half of the 4th century BC (Bailey 1975: 49, Pl. 14-15), especially the sample numbered Q 65 shows close similarities with Sinope samples. Our third example is similar to the oil lamp with catalog number 2047 in the Istanbul Archeology Museum (Kassab-Tezgör and Sezer 1995: 62, Cat. No. 135).

⁷ This oil lamp, which was excavated together with gold wreaths and jewelry, from a burial chamber that yielded extremely rich finds and reveals the burial concept and richness of the Hellenistic Period in the region, is one of the important finds that sheds light on the Early Hellenistic Period of the Black Sea Region.

⁸ This oil lamp, which belongs to the first half of the 4th century BC, must have been produced in a workshop in the Eastern Aegean. Attic specimens were studied by Howland under Type 24 C and dated from the end of the 5th



Figure 5.



Figure 6.

The same is true for two oil lamps (Figure 6, Nr. 20-21) dated to the second half of the 4th century BC. They have globular, wheel-made bodies with incurved sides and rounded rims set off by two grooves. The base is raised and slightly concave beneath. The nozzles are long with slightly waisted flat top and small wick-holes at the rounded tips. There is no handle but on one side of the first lamp is a large fin-like lug. In other words, although they are the same in form, the sample numbered 20 reflects the typical characteristics of Attic in terms of clay and slip properties; It is clear that the sample numbered 21 was not produced in Attica due to the different clay and lining properties (Howland 1958: 70-1, No. 285-300, Pl. 10, 23, 38).⁹ The first example has a metallic glossy black slip, while the second example has a matte slip ranging from black to yellowish red.

There is a similar workshop problem for another oil lamp from the second half of the 4th century BC: With a slightly convex profile and glossy slip ranging from brown to yellowish red, it is really difficult to tell whether this specimen is of Attic production or a local imitation (Figures 6 and 10, Nr. 22) (Howland 1958: 72-4, No. 301-317, Pl. 10, 23, 38, Type 25 B; Brooner 1930: 45, Cat. No. 114-136, Type VII; Bailey 1975: 56, 57, Pl. 16, Q88). A broad, flat top, set off by a deep groove at the shoulder, surrounds the middle filling hole. The substantial nozzle is long. On one side of the lamp is a large fin-like lug. The lamp stands on a raised base, slightly concave below. There are heavy kicks on the floor of the oil chamber. Three lamps that can be dated from the 2nd half of the 4th century BC to the first quarter of the 3rd century BC are also included in the Howland 25B group (Figure 7, Nr. 23-25) (Howland 1958: 72-4, No. 301-317, Pl. 10, 23, 38; Brooner 1930: 45, Cat. No. 114-136, Type VII D). Two of them have lugs (Nr.23,24) and one is without lugs (Nr.25). A groove or grooves surround the filling holes of these three

century BC to the first quarter of the 4th century BC (Howland 1958: 66, No. 257-258, Pl. 9, 37). Brooner, on the other hand, evaluated similar specimens under the title of Type 7 (Brooner 1930: 45, Pl. III, Cat. No. 114-136).

⁹ Both specimens are evaluated in the Howland Type 25 A group (Brooner 1930: 45, Cat. No. 114-36, Pl. III). Brooner evaluated these lamps in Type VII group. The sample numbered Q 85, which is in the collection of the British Museum and is made in Athens, was also dated by Bailey to a time interval from the end of the 4th century BC to the first quarter of the 3rd century BC (Bailey 1975: 55-6, Pl. 16).

lamps with spherical bodies. An oil lamp that is also close to this type, but with a slightly longer spout and whose body begins to transform from spherical to lagynoid, is also considered in Howland Type 25 B and is dated from the 2nd half of the 4th century BC to the first quarter of the 3rd century BC (Figure 7, Nr. 26). The filling hole is surrounded by a row of grooves (Howland 1958: 72-4, No. 301-317, Pl. 10, 23, 38). Among the Sinop finds, two examples dated to the end of the Classical Period are the last examples of this study (Figure 8, Nr. 27-28; Figure 10, Nr. 28). They are dated from the last quarter of the 4th century BC to the first quarter of the 3rd century BC.¹⁰



Figure 7.



Figure 8.

It is difficult to talk about a pure Greek phenomenon after the 4th century BC. There will be a synthesis in every field, which is called Hellenism. With Hellenism, the productions of especially the coastal cities of Anatolia were either imitated or imported from a production center that imitated them. Because there are hundreds of types of same oil lamp. In the 4th century BC, bowls and oil lamps are still being made under the influence of Attica. In the 3rd century BC, different ceramics began to be made in Anatolia. There are more commercial, commercial productions in kitchen utensils for daily use, commercial amphorae. In the 3rd century BC, Athens retreated into its shell and other centers became original. Among these centers were Ephesos, Knidos, Pergamon and Alexandria. Examples of Pergamon and Alexandria, especially Ephesos, will be seen in Sinop in the later period. These later period oil lamps will be the subject of a different study.

¹⁰ Types of oil lamps that are quite similar in form to each other have been found in different centers. However, some of them are lugs. For example, the Calymnos find Q 431, evaluated in the British Museum Collection, is similar to the Sinope find number 2.144.54 in terms of the lamp, the form of the body and the grooves surrounding the filling hole in the discus, but without a lug. The Athenian lamp number Q92 is similar to our example in terms of both its luminous and form (Bailey 1975: 58, Pl. 3, 18, 19 (Q92), 187, Pl. 82-83 (Q431)). Sample number 20.10.74 from Sinope, on the other hand, is similar to the sample with catalog number 400 from the Agora of Athens finds and evaluated under tp 28 A. This example is also dated to a period from the last quarter of the 4th century BC to the second quarter of the 3rd century BC (Howland 1958: 91-2, Pl. 41, Cat. No. 400). The same type is considered by Brooner in Type 13 (Brooner 1930: 53, Pl. V).

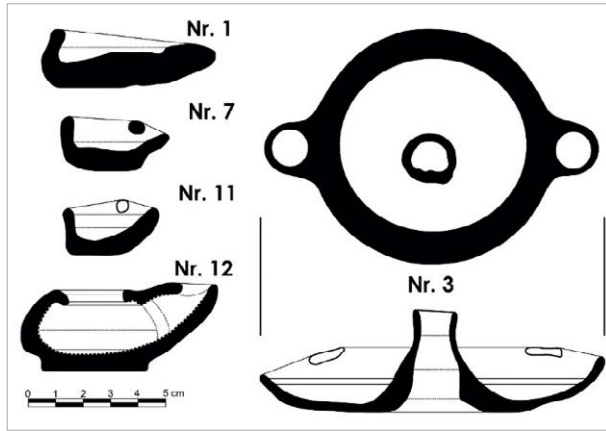


Figure 9.

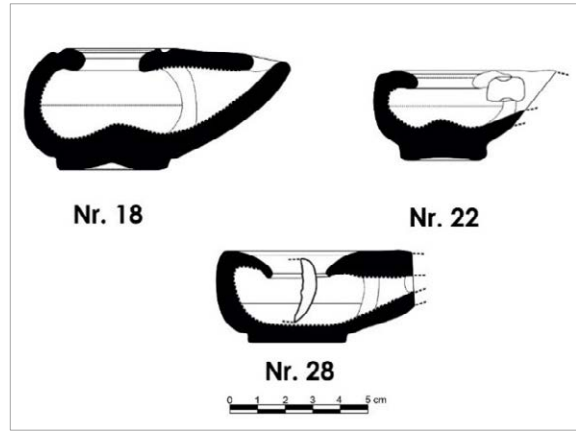


Figure 10.

Catalogue

Nr. 1 (Figures 1 and 9)

Inventory Number: 1.1.74

Findspot: Sinope

Dimensions: L: 6.5cm; W: 5.3cm; H: 2.1cm

Condition and Fabric: Wheel-made. Intact. Clay 2.5 YR 7/4 light reddish brown, self-slip

Description: Lamp with open nozzle; burn marks.

Parallels: Howland 1958: 15-16, Nr. 38-42, Pl. 2,30.

Date: End of 7th century BC - first quarter of 6th century BC

Nr. 2 (Figure 1)

Inventory Number: 2.143.54

Findspot: Sinope excavations (1952-1954).

Dimensions: L: 12cm; W: 9.9cm; H: 1.6cm

Condition and Fabric: Wheel-made. Clay 10 YR 7/4 very pale brown, glaze 10 YR 5/1 gray. One of the nozzles and a part of rim broken off.

Description: Broad shallow, open lamp with two bridged nozzle and central tube. Flat rim slopes downward. Central tube with conical profile. Thin clay.

Parallels: Kassab-Tezgör 1995: 52-53, Nr.106 (Lindos); Zhuravlev et.al. 2007: 32, 36, Nr.1-14.

Date: Last quarter of 7th century BC

Nr. 3 (Figures 1 and 9)

Inventory Number: 8.61.70

Findspot: Sinope

Dimensions: L: 12.1cm; W: 8.7cm; H: 2.4cm

Condition and Fabric: Wheel-made. Clay 5 YR 8/3 pink, glaze between 2.5 YR 8/4 pink and 2.5 YR 5/2 weak red. Complete except the chips on the rim and the central tube.

Description: Broad shallow, open lamp with two bridged nozzle and central tube. Flat rim slopes downward. Central tube with conical profile. Thin clay. Black glaze on the floor of the interior fired red to brown.

Date: Last quarter of 7th century BC

Nr. 4 (Figure 2) Inventory Number: 12.4.2016 Findspot: Sinope. Dimensions: L: 4.2cm; W: 3.1cm; H. 1.8cm Condition and Fabric: Wheelmade. Intact. Clay 5 YR 7/8 reddish yellow, self-slip. Description: Miniature lamp with bridged nozzle. The body is slightly concave and has an upright profile. Flat base. Parallels: Kassab Tezgör and Sezer 1995: Nr.141 (Lindos); Bussière and Lindros Wohl 2017: 12. Nr.8. Date: 6th century BC
Nr. 5 (Figure 2) Inventory Number: 12.6.2016 Findspot: Sinope. Dimensions: L: 4cm; W: 3.2cm; H. 1.9cm Condition and Fabric: Wheel-made. Intact. Clay 5 YR 7/8 reddish yellow, self-slip. Description: Miniature lamp with bridged nozzle. The body is slightly concave and has an upright profile. Flat base. Parallels: Kassab-Tezgör and Sezer 1995: Nr.141 (Lindos); Bussière and Lindros Wohl 2017: 12, Nr.8. Date: 6th century BC
Nr. 6 (Figure 2) Inventory Number: 12.2.2016 Findspot: Sinope. Dimensions: L: 4.1cm; W: 3.2cm; H. 1.9cm Condition and Fabric: Wheel-made. Intact. Clay 5 YR 7/8 reddish yellow, self-slip. Description: Miniature lamp with bridged nozzle. The body is slightly concave and has an upright profile. Flat base. Parallels: Kassab-Tezgör and Sezer 1995: 48, Nr.92. Date: 6th century BC
Nr. 7 (Figures 2 and 9) Inventory Number: 12.1.2016 Findspot: Sinope. Dimensions: L: 3.9cm; W: 3.4cm; H. 2cm Condition and Fabric: Wheel-made. Intact. Clay 5 YR 7/8 reddish yellow, self-slip. Description: Miniature lamp with bridged nozzle. The body is slightly concave and has an upright profile. Flat base. Parallels: Kassab-Tezgör and Sezer 1995: 48, Nr.92. Date: 6th century BC
Nr. 8 (Figure 2) Inventory Number: 12.7.2016 Findspot: Sinope. Dimensions: L: 3.8cm; W: 2.8cm; H. 1.8cm Condition and Fabric: Wheel-made. Intact. Clay 5 YR 7/8 reddish yellow, self-slip.

Description: Miniature lamp with bridged and wide nozzle. The body is slightly concave and has an upright profile. Flat base. Date: 6th century BC
Nr. 9 (Figure 2) Inventory Number: 12.3.2016 Findspot: Sinope. Dimensions: L: 4.2cm; W: 2.8cm; H: 1.8cm Condition and Fabric: Wheel-made. Intact. Clay 5 YR 7/8 reddish yellow, self-slip. Description: Miniature lamp with bridged and wide nozzle. The body is slightly concave and has an upright profile. Flat base. Date: 6th century BC
Nr. 10 (Figure 2) Inventory Number: 12.8.2016 Findspot: Sinope. Dimensions: L: 3.7cm; W: 2.7cm; H: 1.5cm Condition and Fabric: Wheel-made. Intact except small chips on rim and nozzle. Clay 5 YR 7/8 reddish yellow, self-slip. Description: Miniature lamp with bridged and wide nozzle. The body is slightly concave and has an upright profile. Flat base. Date: 6th century BC
Nr. 11 (Figures 2 and 9) Inventory Number: 12.5.2016 Findspot: Sinope. Dimensions: L: 3.6cm; W: 2.6cm; H: 1.6cm Condition and Fabric: Wheel-made. Intact. Clay 5 YR 7/8 reddish yellow, self-slip. Description: Miniature lamp with bridged and wide nozzle. The body is slightly concave and has an upright profile. Flat base. Date: 6th century BC
Nr. 12 (Figures 3 and 9) Inventory Number: 2.141.54 Findspot: Sinope excavations (1952-1954). Dimensions: L: 7.4cm; W: 5.5cm; H: 3.2cm Condition and Fabric: Wheel-made. Intact. Clay 7.5 YR 7/3 pink, glaze 5 YR 6/3 light reddish brown. Description: Slightly curved body. Narrow, inward sloping rim. Slightly raised flat base. Burn marks on slightly long nozzle. Parallels: Howland 1958: Type 30A; Brooner 1930: Type IV, Nr. 62; Bailey 1975: Q378. Date: Second half of the 5th century BC-First half of the 4th century BC
Nr. 13 (Figure 3) Inventory Number: 52.131.54 Findspot: Sinope excavations (1952-1954). Dimensions: L: 6.2cm; W: 4.9cm; H: 2.2cm

Condition and Fabric: Wheel-made. Intact. Clay 7.5 YR 7/4 pink. Description: lamp with curved walls. Slightly incurved rim. A deep groove at the shoulder surrounds the filling hole. Burn marks on short, rounded nozzle. Slightly raised flat base. Parallels: Bailey 1975: 123, Pl. 42, Q252. Date: Second half of the 5th century BC-First half of the 4th century BC
Nr. 14 (Figure 4) Inventory Number: 8.62.70 Findspot: Sinope. Dimensions: L: 7.7cm; W: 6.2cm; H: 3.3cm Condition and Fabric: Wheel-made. Horizontal handle and tip of the nozzle broken off. Small chips on the shoulder. Clay 5 YR 6/4 light reddish brown, glossy glaze 2.5/N black. Description: Deep body with vertical sides and slightly convex rim sloping towards the filling hole. Flat topped nozzle. Horizontal band handle. Slightly raised flat base. Parallels: Howland 1958: Type 23C; Bailey 1975: 66.67, Pl. 14, Q65; Brooner 1930: Nr. 85 (Type VI). Date: End of the 5th century BC- 3rd century BC
Nr. 15 (Figure 4) Inventory Number: 8.36.71 Findspot: Sinope. Dimensions: L: 7.6cm; W: 6.6cm; H: 4.5cm Condition and Fabric: Wheel-made. Horizontal handle and the nozzle broken off. Small chips on the shoulder. Clay 5 YR 7/4 pink, glossy glaze 2.5/N black Description: Deep globular body with a curved shoulder, separated from a large filling-hole by a deep circular groove. Flat topped nozzle. Horizontal band handle. Raised base, slightly concave underneath with a matching convexity in the floor of the lamp. Parallels: Brooner 1930: 15 (Type VIIA). Date: End of the 5th century BC- 3rd century BC
Nr. 16 (Figure 4) Inventory Number: 8.45.71 Findspot: Sinope. Dimensions: L: 8.7cm; W: 6.5cm; H: 3.9cm Condition and Fabric: Wheel-made. Horizontal handle and tip of the nozzle broken off. Chips on the shoulder. Clay 5 YR 7/4 pink, glossy glaze 2.5/N black. Description: Deep body with vertical sides and slightly convex rim sloping towards the filling hole. Flat topped nozzle. Horizontal band handle. Raised base, slightly concave underneath with a matching convexity in the floor of the lamp. Parallels: Howland 1958: Type 23C; Bailey 1975: 66,67, pl. 14. Date: End of the 5th century BC- 3rd century BC
Nr. 17 (Figure 5) Inventory Number: 9.5.72 Findspot: Sinope. Dimensions: L: 8.1cm; W: 6.5cm; H: 4.2cm Condition and Fabric: Wheel-made. Lug and the tip of the nozzle broken off. Clay 7.5 YR 6/4 light brown, glaze

glay 1 2.5/N black. Description: Deep globular body with a curved shoulder, separated from a large filling-hole by a deep circular groove. Flat topped, long nozzle. On the left side of the lamp is a large fin-like lug. Raised base, slightly concave underneath with a matching convexity in the floor of the lamp. Parallels: Kassab-Tezgör and Sezer 1995: Nr. 160. Date: First half of the 4th century BC
Nr. 18 (Figures 5 and 10) Inventory Number: 4.1.80 Findspot: Sinope. Dimensions: L: 9.2cm; W: 6.3cm; H: 3.7cm Condition and Fabric: Wheel-made. Intact. Clay 7.5 YR 7/4 pink, glaze glay 1 2.5/N black to 5 YR 4/6 yellowish red. Description: Deep globular body with a curved shoulder, separated from a large filling-hole by a deep circular groove. Flat topped, long nozzle. Raised base, slightly concave underneath with a matching convexity in the floor of the lamp. Date: First half of the 4th century BC
Nr. 19 (Figure 5) Inventory Number: 4.3.74 Findspot: Sinope. Dimensions: L: 9.6cm; W: 6.4cm; H: 4.4cm Condition and Fabric: Wheel-made. Intact. Clay 7.5 YR 6/4 light brown, glaze glay 1 2.5/N black. Description: Deep globular body with a curved shoulder, separated from a large filling-hole by a deep circular groove. Flat topped, long nozzle. Burn marks on nozzle. Raised base, slightly concave underneath with a matching convexity in the floor of the lamp. Date: First half of the 4th century BC
Nr. 20 (Figure 6) Inventory Number: 2.147.54 Findspot: Sinope excavations (1952-1954). Dimensions: L: 8.4cm; W: 5.6cm; H: 3.4cm. Condition and Fabric: Wheel-made. Intact. Clay 5 YR 7/6 reddish yellow, glaze 5 YR 2.5/1 black. Description: Deep globular body with a curved shoulder, separated from a large filling-hole by two deep circular grooves. Flat topped, long nozzle. Burn marks on nozzle. On the left side of the lamp is a large fin-like lug. Raised base, slightly concave underneath with a matching convexity in the floor of the lamp. Parallels: Howland 1958: Type 25A; Bailey 1975: 141, Nr. Q85. Date: Second half of the 4th century BC.
Nr. 21 (Figure 6) Inventory Number: 12.1.76 Findspot: Sinope Dimensions: L: 9.2cm; W: 6.1cm; H: 3.8cm. Condition and Fabric: Wheel-made. Tip of the nozzle broken off. Clay 7.5 YR 7/4 pink, glaze Gley 1 2.5/N black to 5 YR 4/6 yellowish red. Description: Deep globular body with a curved shoulder, separated from a large filling-hole by two deep circular

grooves. Flat topped, long nozzle. Burn marks on nozzle. Raised base slightly concave. The floor of the lamp rises to a heavy, convex hump inside. Parallels: Howland 1958: Type 25A; Bailey 1975: 141, Nr. Q85. Date: Second half of the 4th century BC
Nr. 22 (Figures 6 and 10) Inventory Number: 7.5.75 Findspot: Sinope. Dimensions: L: 6.9cm; W: 5cm; H. 3.2cm Condition and Fabric: Wheel-made. Tip of the nozzle broken off. Clay 7.5 YR 6/3 light brown, glossy glaze 7.5 YR 4/2 brown to 5 YR 5/6 yellowish red. Description: Body with almost vertical sides. A broad, flat top set off by a deep groove at the shoulder surrounds the filling hole. Flat topped, long nozzle. On the left side of the lamp is a large fin-like lug. Raised base, slightly concave below. The floor of the lamp rises to a heavy, convex hump inside. Parallels: Howland 1958: Type 25B; Bailey 1975: Q88. Date: Second half of the 4th century BC
Nr. 23 (Figure 7) Inventory Number: 25.1.82 Findspot: Sinope. Dimensions: L: 6.8cm; W: 5.2cm; H. 2.8cm Condition and Fabric: Wheel-made. Intact. Clay 10 YR 7/4 very pale brown, self-slip. Description: Globular body. A broad, flat top set off by a deep groove at the shoulder surrounds the filling hole. Flat topped. Burn marks on nozzle. On the left side of the lamp is a fin-like lug. Raised base, slightly concave below. Parallels: Howland 1958: Type 25B. Date: Second half of the 4th century BC- First quarter of the 3rd century BC
Nr. 24 (Figure 7) Inventory Number: 34.1.78 Findspot: Sinope. Dimensions: L: 7.5cm; W: 6.1cm; H. 4cm Condition and Fabric: Wheel-made. Tip of the nozzle broken off. Clay 7.5 YR 7/4 pink, self-slip. Description: Deep globular body with a curved shoulder, separated from a large filling-hole by a deep circular groove. Flat topped, long nozzle. On the left side of the lamp is a fin-like lug. Raised base slightly concave. The floor of the lamp rises to a heavy, convex hump inside. Parallels: Howland 1958: Type 25B; Brooner 1930: Type VIID, Nr.126. Date: Second half of the 4th century BC- First quarter of the 3rd century BC
Nr. 25 (Figure 7) Inventory Number: 2.145.54 Findspot: Sinope excavations (1952-1954). Dimensions: L: 8.2cm; W: 7cm; H. 3.7cm Condition and Fabric: Wheel-made. Tip of the nozzle broken off. Clay 7.5 YR 7/3 pink, glaze gley 2.5/N black. Description: Deep globular body with a curved shoulder, separated from a large filling-hole by a deep circular groove. Rim slopes downward. Flat topped, long nozzle. Raised base. The floor of the lamp rises to a heavy,

convex hump inside. Parallels: Howland 1958: Type 25B. Date: Second half of the 4th century BC- First quarter of the 3rd century BC
Nr. 26 (Figure 7) Inventory Number: 4.2.72 Findspot: Sinope. Dimensions: L: 9.7cm; W: 6.6cm; H. 2.7cm Condition and Fabric: Wheel-made. Chips on nozzle. Clay 7.5 YR 6/3 light brown, glaze gley 1 3/N very dark gray. Description: Body with a curved shoulder, separated from a large filling-hole by a deep circular groove. Rim slopes downward. Flat topped, long nozzle. Raised base. Parallels: Howland 1958: Type 25B (without lug). Date: Second half of the 4th century BC- First quarter of the 3rd century BC
Nr. 27 (Figure 8) Inventory Number: 2.144.54 Findspot: Sinope excavations (1952-1954). Dimensions: L: 7.1cm; W: 5.6cm; H. 2.8cm Condition and Fabric: Wheel-made. Tip of the nozzle and lug broken off. Clay 5 YR 7/4 pink, glaze 4/N dark gray to 2.5 YR 7/4 light reddish brown. Description: Deep globular body with a curved shoulder, separated from filling-hole by a deep circular groove. Flat topped, long nozzle. On the left side of the lamp is a fin-like lug. Raised base. The floor of the lamp rises to a heavy, convex hump inside. Parallels: Bailey 1975: Q92. Date: Last quarter of the 4th century BC- First quarter of the 3rd century BC
Nr. 28 (Figures 8 and 10) Inventory Number: 20.10.74 Findspot: Sinope. Dimensions: L: 5.8cm; W: 5.3cm; H. 3.5cm Condition and Fabric: Wheel-made. Nozzle and lug broken off. Clay 7.5 YR 6/4 light brown, glaze gley 1 2.5/N black. Description: Deep globular body with a curved shoulder, separated from filling-hole by a deep circular groove. Inward sloping rim. Flat topped, long nozzle. On the left side of the lamp is a fin-like lug. Raised base, slightly concave underneath with a matching convexity in the floor of the lamp. Parallels: Bailey 1975: Q525; Kassab-Tezgör and Sezer 1995: Nr. 204. Date: Last quarter of the 4th century BC- First quarter of the 3rd century BC

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Archaeological and Philological Interpretation of the *Globus Cruciger* Symbol

Grzegorz Sus¹

Abstract

The aim of the article is to show the origins of the early Christian symbol of the cross on the globe. The author begins with the ancient representation of the goddess Nike and demonstrates that from her image, under the influence of time, external events, changes in human perception of the world, and the development of theological thought, a process began that ultimately led to the representation of the *globus cruciger* symbol. This evolution can be traced through the examination of archaeological findings from the Ancient Greece and Rome, as well as through careful reading of ancient texts (both pagan and Christian).

Introduction - Justinian's Column

Procopius of Caesarea, the famous Byzantine historian who lived in the 6th century AD, begins his work *On Buildings* (Greek: *Περί κτισμάτων*, Latin: *De aedificiis*) by describing one of the columns placed in the square called the *Augustaion* (*Αὐγουσταῖον*). It was surmounted by a bronze statue depicting Justinian sitting on a horse. The emperor held in his left hand a spherical object—what is now known as the *globus cruciger*. Procopius describes it in detail: 'And in his left hand he holds a globe², by which the sculptor signifies that the whole earth and sea are subject to him. Yet he has neither sword, nor spear, nor any other weapon, but a cross stands upon the globe which he carries the emblem by which alone he has obtained both his empire and his victory in war' (Procopius, *De aedificiis* 1.2.1-12).³ There are two important things I'd like to mention. First of all, representing the Earth as a globe may seem unremarkable to a 21st-century reader, but we should remember that this concept was not so self-evident in antiquity. Secondly, associating the cross with victory was not obvious in the ancient world as well, even within Christian communities in the first centuries of our era.

Having these two aspects in mind, I decided to undertake an attempt to reconstruct the origins of the *globus cruciger* symbol in the light of archaeological artifacts and ancient writings, although I'm aware

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² I agree with this translation of the Greek word *πόλος* although it does not appear in dictionaries.

³ Translation by H.B Dewig.

that these are only preliminary remarks. I divided the entire discourse into four parts. At the beginning, some perspectives on the structure of the universe and the Earth (based on the beliefs of ancient inhabitants of the Near East, Egypt and Greece) will be briefly presented. In the second part, attention will be given to the winged images of the goddess Nike and their association with victory and relation to the sphere. In the next part there will be a brief reflection on the early Christian understanding of the Cross as a sign of salvation and victory over sin and Satan. The last part will compile previous reflections and show that they are concentrated like in a lens and acquire new meaning in the *globus cruciger* symbol.

Ancient views on the structure of the universe and the shape of the Earth

It can be difficult for us (who have instant online access to images of the Earth, other planets, and the Sun) to imagine how ancient people envisioned the world or the universe. Among other factors, individual perceptions and collective myths played a significant role in forming different views of the Earth's shape. It is intriguing to consider mythical depictions, such as that of Nut, a naked Egyptian goddess who was believed to act as a dome covering the Earth, with only her feet (or only her toes) and fingers touching the Earth (represented by the god Geb) (Velde 1977: 161-70).



Figure 1. Coffin of Imen-m-per-Mut, Cairo, Egyptian Museum JE 29706 (After Niwiński 1989).

This representation has its roots in mythology, but other (more rational) concepts about the shape of the Earth were developed later in Egypt. A popular view was that the Earth was a flat disc floating on water, and the sky was supported by four pillars (Frankfort *et al.* 1997: 45-6).

The people of Mesopotamia held a similar belief; their ancient texts indicate that the Earth was a ‘solid block of matter floating on water’ (Horowitz 1998: 318). The sky, which could be divided into three parts, may have been shaped like a dome made of a hard material such as stone, specifically jasper (the lowest heaven) (Horowitz 1998: 13).

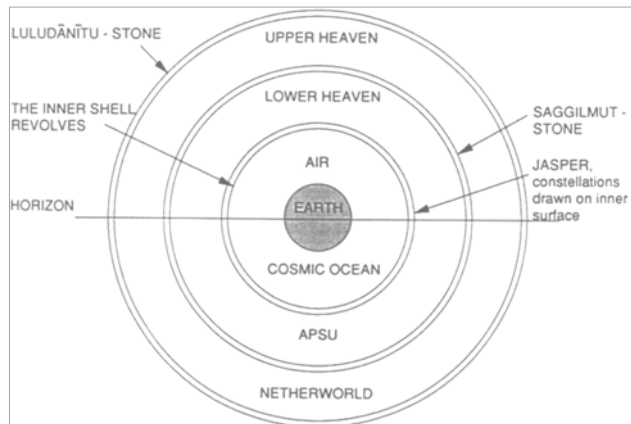


Figure 2. The shape of the cosmos according to cuneiform sources (After Huxley 1997).

Reading the sacred books of the Hebrews, we encounter the difficulty of describing the shape of the Earth. While the pillars of the Earth can be found in some scriptures (Job 9:6)⁴, on the other hand the earth is suspended on nothing (Job 26:7)⁵; Moreover, there are passages that speak of the four corners of the Earth (Ezek 7:2)⁶ and at the same time God ‘sits above the circle(!) of the Earth’ (Isa 40:22).⁷ Despite these contradictions there are numerous illustrations trying to reconstruct the biblical view of the shape of the Earth as a flat disc resting on pillars or floating on water, and covered by a dome of the firmament, but they are more or less a mixture of philological thoughts and hypotheses, as Giovanni Schiaparelli mentions in his book ‘Astronomy in the Old Testament’. (Schiaparelli 1905: 22, 38).

Among the ancient Greeks there were also different views on the shape of the Earth. Aristotle, in his work ‘On the Heavens’ (gr. *Περὶ Οὐρανοῦ*, lat. *De caelo*) describes this diversity as follows: *Παραπλησίως δὲ καὶ περὶ τοῦ σχήματος ἀμφισβητεῖται· τοῖς μὲν γὰρ δοκεῖ εἶναι σφαιροειδῆς, τοῖς δὲ πλατεῖα καὶ τὸ σχῆμα τυμπανοειδῆς*. ‘There is about as much dispute concerning its shape. Some believe that it is spherical, some that it is flat and drum-shaped’ (Aristoteles, *De caelo*, 293b). He identifies Thales as a thinker who believed that the earth ‘was situated on water’ (*ἐφ’ ὕδατος κεῖσθαι*) (Aristoteles, *De caelo*, 294a). Aristotle attributes to Anaximenes, Anaximander and Democritus the view that the Earth, due to its ‘flatness’ (*τὸ πλάτος*) covers the air below like a lid (*ἐπιπωμαίνει τὸν ἀέρα τὸν κάτωθεν*) (Aristoteles, *De*

⁴ Hebrew: *וְעַמּוּנֵי הָאָרֶץ מְקוּמָהּ אַרְבָּעַת הַמְּרָזְזִי*; Septuagint: *ὁ σείων τὴν ὑπ’ οὐρανὸν ἐκ θεμελίων, οἱ δὲ στῦλοι αὐτῆς σαλεύονται*).

⁵ Hebrew: *עַל־בְּלִיַּמָּה אֶרֶץ תִּלָּה*; Septuagint: *κρεμάζων γῆν ἐπὶ οὐδενός*.

⁶ Hebrew: *הָאָרֶץ כְּנִפּוֹת עַל־אַרְבַּעַת הַקָּצִי בָּא הָקָדֵשׁ*; Septuagint: *Πέρας ἡκει, τὸ πέρας ἡκει ἐπὶ τὰς τέσσαρας πτέρυγας τῆς γῆς*.

⁷ Hebrew: *הָאָרֶץ עַל־חֻיּוֹ הַיָּשֵׁב*; Septuagint *ὁ κατέχων τὸν γῦρον τῆς γῆς*.

caelo, 294b). Anaximander is said to be the author of the first map representing a flat earth surrounded by the sea (Lladó Mas 2025). However, the Stagirite takes a different view on this matter and believes that the Earth must be a spherical object (Σχήμα δ' ἔχειν σφαιροειδὲς ἀναγκαῖον αὐτήν) (Aristoteles, *De caelo* 297a). It became the main view on the shape of the Earth together with idea of cosmic spheres - the main cosmographical view of the universe. However, not everyone agreed with such idea of a geocentric spherical world. Aristarchus of Samos challenged the geocentric theory of the world and, long before the Polish scientist Nicolaus Copernicus, put forward a proposal for a heliocentric theory that did not meet with public approval (Heath 2004).

Not only was the geocentric theory contested but also the sphericity of the Earth by such authors as for example, Cosmas Indicopleustes, who rejected it as a pagan belief incompatible with the sacred scriptures (Cosmas Indicopleustes, *Topographia christiana* 2:24).

Winged Images of the Goddess Nike

After a brief introduction concerning the ancient people's view of the shape of the earth it is necessary to move on to the second part of the article, in which the figure of the goddess Nike and her winged images appearing from the 6th century onwards will be briefly introduced. Some scholars point to the idea that Nike and Athena Nike were a single deity and only over time did the former acquire her own independent personality, but others argue in favour of the original distinctiveness of the goddess of victory (Sikes 1895: 280-3). Already in Hesiod one can find a few verses describing her origin:

Στύξ δ' ἔτεκ' Ὠκεανοῦ θυγάτηρ Πάλλαντι μιγεῖσα

Ζῆλον καὶ Νίκην καλλίσφυρον ἐν μεγάροισι

καὶ Κράτος ἡδὲ Βίην ἀριδείκετα γείνατο τέκνα.

τῶν οὐκ ἔστ' ἀπάνευθε Διὸς δόμος, οὐδέ τις ἔδρη,

οὐδ' ὁδός, ὅππῃ μὴ κείνοις θεὸς ἡγεμονεύει,

ἀλλ' αἰεὶ παρ Ζηνὶ βαρυκτύπῳ ἐδριόωνται.

'Styx, Ocean's daughter, intermingled with Pallas

And bore Zeal and beautiful-ankled Victory in [her] chambers,

And Strength and Force – famous children she bore,

And they have no house apart from Zeus', nor sitting place

nor path except where the god leads them,

And they sit forever with deep-thundering Zeus' (Hesiodus, *Theogonia*, vv. 382-387).

Apart from a one-word mention of Nike's 'beautiful ankles' (*καλλίσφυρον*), Hesiod does not provide any further description of her appearance. However, in the 6th century, winged female figures (also interpreted as Nike, though this identification is sometimes contested) started appearing on vases (Tolla-Christakou 2021: 34-67). Additionally, coins depicting the goddess of victory have been found from various places, including Olympia, dating back to the same period (Bellinger 1962).



Figure 3. Coin with winged Nike from Olympia
(After Beellinger and Berlincourt 1962).

Also in the archaic period in the texts of Pindar and Bacchylides, Nike appears as the goddess of victory, however, reference is made to victories in gymnastic and musical agonies (Sikes 1895: 281). One of the earliest mentions of a winged Nike can be found in Aristophanes' 'The Birds':

{ΠΙ.} Ληρεῖς. Καὶ νῆ Δί' ὃ γ' Ἑρμῆς

πέτεται θεὸς ὦν πτέρυγας τε φορεῖ, κάλλοι γε θεοὶ πάνυ πολλοί.

Αὐτίκα Νίκη πέτεται πτερύγοιν χρυσαῖν καὶ νῆ Δί' Ἑρως γε·

Ἴριν δέ γ' Ὅμηρος ἔφασκ' ἰκέλην εἶναι τρήρωνι πελεΐῃ.

[PITHETAERUS] 'Oh god, nonsense! Hermes being a god, flies and has wings, as do a lot of gods. First of all, Nike flies with two golden wings, and, oh god, Eros too, and Iris, as Homer said, is like a timorous dove' (Aristophanes, *Aves*, vv. 572-5).

In the scholia to this passage, we read:

(...) νεωτερικὸν τὸ τὴν Νίκην καὶ τὸν Ἑρωτα ἐπτερωῶσθαι. Ἀρχερμον γάρ φασί τινες τὸν Βουπάλου καὶ Ἀθήνιδος πατέρα, οἱ δὲ Ἀγλαοφῶντα τὸν Θάσιον ζωγράφον, πτηνὴν ἐργάσασθαι τὴν Νίκην, ὡς οἱ περὶ Καρύστιον τὸν Περγαμηνόν φασι.

'It is new that Nike and Eros have wings. Some say that Archermos the father of Bupalos and Athenis made the winged [representation of] Nike, others that the painter Aglaophont of Thassos, although others say so of Karystion of Pergamon.' (White 1914: 120).

For further consideration, it will be necessary to pay attention to the statue of Zeus at Olympia made by the famous sculptor Phidias in the fifth century BC. A description of this magnificent masterpiece can be found in the work of Pausanias 'Description of Greece' (*Ἑλλάδος Περιήγησις*):

καθέζεται μὲν δὴ ὁ θεὸς ἐν θρόνῳ χρυσοῦ πεποιημένος καὶ ἐλέφαντος· στέφανος δὲ ἐπίκειται οἱ τῇ κεφαλῇ μεμιμημένος ἐλαίας κλώνας. ἐν μὲν δὴ τῇ δεξιᾷ φέρει Νίκην ἐξ ἐλέφαντος καὶ ταύτην καὶ χρυσοῦ, ταινίαν τε ἔχουσιν καὶ ἐπὶ τῇ κεφαλῇ στέφανον·.

‘The god, made of gold and ivory, sits on a throne. A garland lies on his head imitating an olive branch. In his right hand he carries Nike, made of ivory and gold (as the statue itself); wearing a ribbon and [having] a garland on her head’ (Pausanias, *Graecae description*, 5. 11.1).

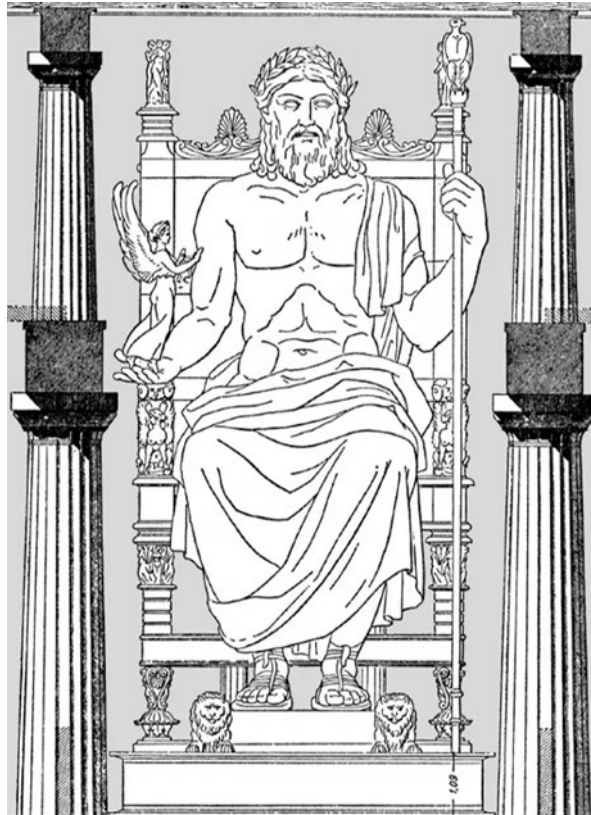


Figure 4. Reconstruction of the statue of Zeus from Olympia (After Barringer 2010).

Coins created in Olympia, on which we see Zeus seated on a throne and holding the goddess of victory in his hand, agree with the description given by Pausanias (Clayton and Price 2015: 64). There is no doubt that Hellenistic rulers such as Alexander and Lysimachus struck coins bearing their images in imitation of the statue of Phidias. They were probably not inspired directly by this representation, but their coinage can be seen as part of parallel iconographic developments (Bellinger and Berlincourt 1962: 21–43).

It is problematic to determine at what point in history in the representations of emperors Nike was no longer depicted solely on an outstretched hand, but on a sphere held by that hand. It is generally assumed that the origins of this connection can be traced back to when Caesar Augustus placed a statue of Nike of Tarentum (standing on a globe) in the new senate building (*Curia Iulia*) (Bellinger and

Berlincourt 1962: 53). H. A. Pohlsander notes that 'Victories of this type appear repeatedly on Augustan coins and are clearly based on the Victory in the senate house' (Pohlsander 1969: 590).



Figure 5. Statuette of Victory in the National Archaeological Museum at Naples (After Pohlsander 1969).

From here, it was only a small step toward combining the 'new' image of Nike with the seated ruler. The best example of the fact that such a fusion (emperor + globe with Nike in his hand) took place is the Jupiter statue dating from the 1st century AD, which is one of the most important monuments of the Russian Hermitage Museum. The same museum also houses a statue of Caesar Augustus in an analogous style.

Early Christian Understanding of the Cross

We can ask: why it was the Cross that appeared in place of the goddess Nike on the globe, rather than other symbols more popular in early Christianity: the fish, the anchor, the alpha and omega, or the phoenix.

It is important to remember that for ancient people the cross was a sign of ignominious death. Saint Paul, in his first letter to the Corinthians, wrote the following words: *ἡμεῖς δὲ κηρύσσομεν Χριστὸν ἐσταυρωμένον, Ἰουδαίοις μὲν σκάνδαλον ἔθνεσιν δὲ μωρίαν*, 'but we preach Christ crucified, a stumbling block to Jews and folly to Gentiles' (1 Cor 1:23). The Jews, believing in an inaccessible, powerful God, whom they could not even depict in their temple, would not have been able to accept that he would stoop to such a level as taking on flesh, let alone dying on the cross. To them it was blatant idolatry and a complete lie. The pagans also regarded the Christian religion as foolishness, exemplified by the

description of the scurrilous behaviour of Christians in the work of Minucius Felix, where we can find worship of a donkey, incestuous relations, or bloody initiations. Jesus is there described as a man punished for his wickedness with the supreme suffering – crucifixion (*hominem summo supplicio pro facinore punitum et crucis ligna feralia eorum caerimonias fabulatur*) (Minucius Felix, *Octavius* 9). The motif of a worshipped donkey – and therefore onolatry – is popular in the context of accusations made against Christians. The graffito of Alexamenos, which depicts a man with the head of a donkey with his arms outstretched (as if crucified), is interpreted in this context, bearing the mocking inscription: ‘Alexamenos worship the God’ (ΑΛΕΞΑΜΕΝΟC CEBETE ΘΕΟΝ) (Harley-McGowan 2019: 105-40). In addition to such more well-known examples, we also have some that are less well-known in scholarly research and perhaps more difficult to interpret, such as the image from Oroszvár (Sági 1968: 399).



Figure 6. Alexamenos Graffito (After Harley-McGowan 2020).

At the same time, Christians were trying to come to terms with the fact that their God had died on the cross, despite their awareness of the resurrection. A theology of the cross was slowly forming. One of the first thinkers to grapple with this problem was the converted philosopher, Justin the Apologist. Here is a short passage from his reflections:

θάλασσα μὲν γὰρ οὐ τέμνεται, ἣν μὴ τοῦτο τὸ τρόπαιον, ὃ καλεῖται ἰστίον, ἐν τῇ νηϊ σῶον μείνῃ· γῆ δὲ οὐκ ἀροῦται ἄνευ αὐτοῦ· σκαπανεῖς δὲ τὴν ἐργασίαν οὐ ποιοῦνται οὐδὲ βανυσουργοὶ ὁμοίως εἰ μὴ διὰ τῶν τὸ σχῆμα τοῦτο ἐχόντων ἐργαλείων. τὸ δὲ ἀνθρώπειον σχῆμα οὐδενὶ ἄλλῳ τῶν ἀλόγων ζώων διαφέρει, ἢ τῷ ὀρθόν τε εἶναι καὶ ἔκτασιν χειρῶν ἔχειν καὶ ἐν τῷ προσώπῳ ἀπὸ τοῦ μετωπίου τεταμένον τὸν λεγόμενον μυζωτῆρα φέρειν, δι' οὗ ἢ τε ἀναπνοή ἐστι τῷ ζῳῳ, καὶ οὐδὲν ἄλλο δείκνυσιν ἢ τὸ σχῆμα τοῦ σταυροῦ.

‘The sea, for instance, cannot be plowed unless the ‘token of victory’ which is called a sail be securely attached to the ship; the earth, too, is not plowed without it; diggers and artisans do all their work with tools of this shape. And man’s form differs from that of irrational animals precisely in this, that it stands

erect, with hands extended, and has on its face extended from the forehead what we call a nose, through which the living creature breathes, and this is exactly the figure of the cross'. (Iustinus philosophus, *Apologia Prima pro christianis ad Antonium Pium*, 55).⁸

The paper, due to its non-theological and limited nature, will not include here a very extended consideration of the perception of the cross by the successive church fathers (it can only refer to more extensive works in a footnote).⁹ The bottom line is that just before the appearance of the oldest representation of the *globus cruciger* symbol, which will be discussed in a moment, following various theological debates, musings, and works produced by early Christian thinkers, Gregory of Nyssa formulated the idea that:

Kształt krzyża jest wizualnym symbolem czterech głównych wymiarów universum i jego jedności w Chrystusie, który w swym wszechogarniającym geście symbolizuje zjednoczenie i władzę nad czteroczęściowym kosmosem. Słowa z perykopy listu do Efezjan (3: 18 i nast.) o szerokości (πλάτος), długości (μῆκος), wysokości (ύψος) i głębi (βάθος) interpretuje Grzegorz z Nysy jako nazwy dla czterech wymiarów krzyża.

'The shape of the cross is a visual symbol of the four main dimensions of the universe and its unity in Christ, who in his all-embracing gesture symbolises the unification and power over the four-part cosmos. The words from the pericope of the letter to the Ephesians (3: 18 ff.) of breadth (πλάτος), length (μῆκος), height (ύψος) and depth (βάθος) are interpreted by Gregory of Nyssa as names for the four dimensions of the cross' (Babraj 2006: 167-8).

According to various reports (whose credibility may rightly be questioned), the 4th century was full of many events in which the glorious cross, associated with victory (over the enemy or over illness), played an important role. The first of these events is the famous Battle of the Milvian Bridge in AD 312, which followed the crisis of the tetrarchy, initiated by the abdication of Diocletian and Maximian in 305. This battle is sometimes considered an important point that probably influenced the future emperor's attitude to the Christian religion. Constantine's victory over Maxentius became ingrained in people's minds (probably later) as an event in which God himself intervened. Christ was to appear twice to the future emperor (Eusebius Pamphilus, *Vita Constantini* 1.28-9). According to Eusebius, the first time God appeared not only to the son of Helena but also to the entire army. In the vision, he pointed to a luminous cross in the sky above the sun. Constantine was also to hear the command of Christ: 'In this sign thou shalt conquer'.

Shortly after this event, the son of Constantius was to experience a second vision, similar to the first. The difference was that this time the revelation took place during sleep. Constantine was then commanded by God to make a sign that was visible in the sky and that would bring him victory. With the coming of the morning, the leader ordered that the traditional banner (*labarum* or *vexillum*) be

⁸ Translation of T. B. Falls.

⁹ See (Reijners 1965; Dekker *et al.* 2010; Longenecker 2015).

modified. He ordered that the ligature of the two Greek letters X and P, which formed the oldest form of the Christogram.



Figure 7. Coin with the Christogram Chi-Rho, drawing of E. Myślińska-Brzozowska (After Bralewski 2020).

The vision is similarly described by Lactantius. In his work, Constantine was also said to have seen Christ in a dream, but somewhat differently from in Eusebius, he admonished the emperor to write the celestial sign of God on shields and so fought a battle (Lactantius, *De mortibus persecutorum*, 48,2). In the Lives of Constantine, the placement of the sign on the soldiers' arms is not mentioned; moreover, Lactantius describes the mark noticed in the dream differently. It was to take form of a staurogram, a ligature of the letters T and P, which was often used in abbreviating the Greek word *ὁ σταυρός*, meaning cross. In both cases, both in Eusebius and in Lactantius, we see a strong connection between the victory in the battle at the Milvian Bridge with the intervention of the God whom the Christians professed to be. It is therefore possible to take this event as an important moment in Emperor Constantine's religious conversion process. However, some scholars disagree that this sign on the shields was to be associated in any way with the Christian religion. They are more inclined to place it in the whole context of a cult associated with the god called Sol Invictus.

Regardless of what Constantine saw in the vision the fact is that a year later the famous Edict of Milan appeared, which marked the beginning of the free confession of every religion including Christianity and which initiated a series of changes (not only religious or social) in the Roman Empire. Two other events were also mentioned by ancient authors. The first was supposed to be the miraculous finding of the cross by St Helena, who, on a pilgrimage to Jerusalem, was said to have had a dream in which she saw the place where the sacred object was deposited (Socrates Scholasticus, *Historia Ecclesiastica*, 1.17). As there were three crosses there, a sick person was brought in who, after contact with the real one, recovered. This was thought to be another event that was a reason to honour the cross, agreeing with the theological reflections on the passion of Christ and the vision concerning the battle of the Milvian Bridge. The second event was described by Cyril of Jerusalem in his letter to Constantine, describing the luminous cross that was to appear over the summit of Golgotha (Babraj 2006: 170). Regardless of the reality of these stories, it is safe to say that in the fourth century and early fifth, the cross begins to be

incredibly revered by Christians and more and more representations of this sign of Christ's victory over sin, evil and unbelievers and a sign of God's power over the entire universe appears.

Globus Cruciger - Summary and Examples of Archaeological Remains

After this somewhat lengthy introduction, let us return for a moment to Procopius' text describing Justinian's column: 'And in his left hand he holds a globe (πόλος), by which the sculptor signifies that the whole earth and sea are subject to him, yet he has neither sword nor spear nor any other weapon, but a cross stands upon the globe which he carries (ἀλλὰ σταυρὸς αὐτῷ ἐπὶ τοῦ πόλου ἐπίκειται), the emblem by which alone he has obtained both his Empire and his victory in war' (Procopius, *De aedificiis*, 1. 2.1-12). Procopius gives us a certain interpretation of the globe held in the hand as a sign of dominion over the earth and the sea - which are depicted as a sphere, since the ancients (with exceptions) had already regarded the earth as a sphere for some centuries. Also, the cross standing on the globe is the source of the emperor's royal authority, as in the case of Constantine, victory in war under the sign of the cross (or christogram as it was mentioned above) came from Christ.

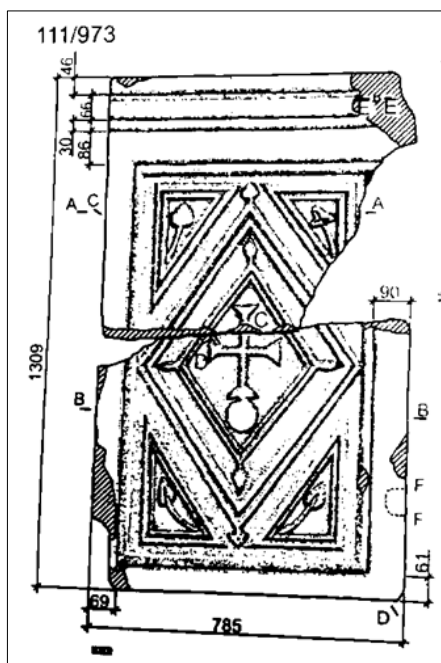


Figure 8. The globus cruciger symbol is an architectural element from Chersonesus Taurica (After Biernacki 2009).

This victorious aspect of the theology of the cross and its connection to power (Garipzanov was somewhat similar to the symbolism and function of the goddess Nike. Perhaps this is why it was not the fish, the anchor, the good shepherd, the alpha and omega or the phoenix (each of which pointed to some other mystery of God or the Church) that replaced Nike on the globe, but the cross. The earliest attested image of the *globus cruciger* symbol appears to be on a coin of Theodosius the Great from AD 422 (Somogyi 2016: 146). Some scholars believe that a *crux gemmata* was placed in Jerusalem in that year, although this is not a *communis opinio* (Babraj 2006: 169-70), What is undeniable is that the symbol

began to spread widely. It appears in architectural details (mainly bema screens), for example in Hagia Sophia in Constantinople, in the Tauride Chersonese (Biernacki 2009), in San Clemente in Rome (Guidobaldi *et al.* 1992). It also occurs in different diptychs (Angelova 2004). The symbol can be found on numerous imperial coins (e.g. from the time of Justinian I).

From the Dumbarton Oaks' collection alone, the following mints can be mentioned: Constantinople, Carthage, Rome, Damascus, Syracuse, Nicomedeia, Antioch, Thessalonike, Kyzikos etc. Undoubtedly, the symbol of the globe cruciger became very closely associated with imperial as well as, later, royal power, and its tradition continues to this day, as we could see at the coronation of British King Charles III, who, before accepting the ring, crown and sceptre, received the globe cruciger, after hearing the words: 'Receive this Orb, set under the Cross, and remember always that the kingdoms of this world are become the kingdom of our God, and of his Christ.'



Figure 9. Coin of the Justinian I with *globus cruciger* symbol
(After <https://www.doaks.org/resources/coins/catalogue/BZC.1969.39/view>).

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Eros at Sea

Sema Talu¹

Abstract

Eros, who is depicted in daily life imitating adults, fighting, playing games, traveling and in many other actions, has always held an important place among the most frequently used images in art. The combination of the state of movement and the sea, which stands out as an important aspect of the god in the descriptive iconographic diversity in question, is the subject of this research. In this study, the iconography of 'Eros in the Sea' is examined with comparative examples from other branches of art, focusing on gems and cameos.

The starting point of the research is the Eros figure on a gold ring that was recovered from the apse fill of the synagogue in Andriake, dating from the end of the 2nd century AD to the middle of the 3rd century AD. Eros, as a child sailing on an amphora, is depicted in a dynamic composition, and the energy of the sea and wind is reflected on Eros' body and the piece of cloth he holds like a sail. One of the special compositions is the depiction of Eros, known for his constant movement, on an amphora, which can be considered as a symbol of maritime transport in terms of its connection with trade and wine, as well as sea creatures and ships in the sea.

Introduction

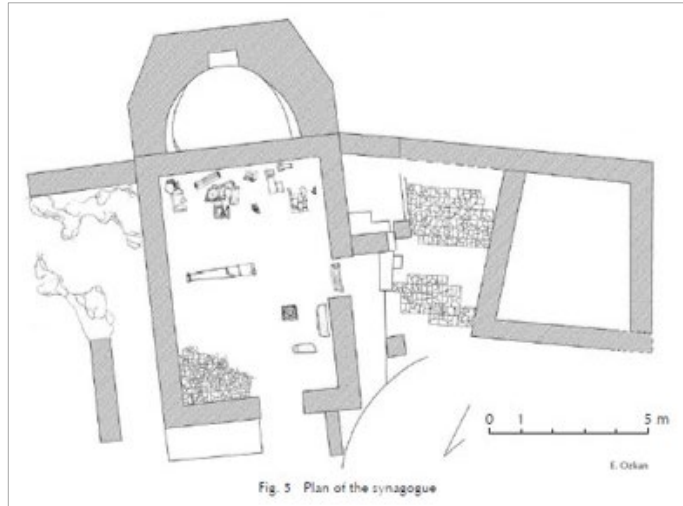
The cameo ring with Eros that is the main subject of this research has raised questions that will require investigating the meaning and parallels of its composition. This narrative, which focuses on the child Eros sailing on an amphora, which we do not encounter frequently in the cameo technique but instead among gems shaped by the intaglio technique, and especially in mosaics, will be discussed together with the connection of this narrative to similar sea scenes, what it means, who it is associated with, its parallels and the determinations of various researchers. Before examining it from an iconographic point of view, it would be useful to look at the site of the artifact and the typological features that will assist in its dating. In this respect, our focus will be on Myra and its port, Andriake, and then the Synagogue that was identified in Andriake and is very important in terms of being the first evidence for Jewish existence here (Çevik *et al.* 2010a: 178).

The Ancient City of Myra, located in the Lycian Region, is located in Demre, in the west of Antalya Bay, in the south of the Teke Peninsula today. Data from excavations shows that Myra and its port Andriake has been a great metropolis from the Classical Period to the end of the Byzantine Period and goes back

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to the 3rd millennium BC in connection with the history of Lycia (Çevik 2015: 358-9; Çevik *et al.* 2023: 225). In the excavations carried out in the orchestra of Myra theater between 2020 and 2021, ceramics dated to the Middle and Late Chalcolithic Period were recovered from a different building layer belonging to a period before the Roman theater (Çevik *et al.* 2023: 225). Apart from the rock tombs, the Classical Period of the city and the port can also be observed in the ceramics and coins recovered from various structures (Aygün 2018: 17). In the Hellenistic Period, Myra appears in written sources. Strabo states that Myra is one of the six largest cities of the Lycian League with three voting rights (Strabo *Geographica*: 14. 3.3). Andriake's Hellenistic Period can be seen not only in written sources and small finds, but also in the towers and fortification walls on Kumdağ Tepe and Taşyuvarlanacağı Tepe (Çevik 2015: 378). It is understood from the tower and the fortification wall on two hills that the settlement and the port entrance were defended (Gambash 2013: 54; Haggis 1996). During the reign of Emperor Hadrian, Andriake had one of its brightest times. In the period from the second half of the 1st century AD to the end of the 2nd century AD, the Lycian cities showed a visible development. During the Hadrianic Period, the two most important structures of Andriake, the granarium and the Plakoma/Port Agora were built. The empire's export of grain from Egypt during this period (Gambash 2013: 54; Haggis 1996) is linked to the granariums built in Andriake and Patara. During and after 7th-8th centuries AD, finds were greatly reduced. Apart from the structures mentioned in Andriake, there are also six churches, two baths (Çevik and Bulut 2014), tombs, workshops, port structures, and dockyards, and most of them have been excavated (Çevik and Bulut 2022).

Figure 1. Plan of the Synagogue
(After Çevik *et al.* 2010b: Fig. 5).



While the alluvium carried by the Demre Stream once provided Myra with a suitable area for settlement, one day it completely covered the city and stopped the settlement by closing the entrance of the Andriake port (Çevik 2015: 363). It has been determined that Myra lies in all its glory under alluvium, whose height varies between 4 and 9 meters. As a result of the geophysical research carried out in 2009 and 2011, it was determined that the city spread in a semi-circle of approximately 1700/1800 meters from the theater (Çevik 2015: 364). The structure that was determined to be a synagogue during the excavations carried out in Andriake, the port of Myra, in 2009 is located in the western corner of the

Horrea Hadriani (Figure 1).² Many important finds were recovered from the building, which faces north, that is, towards the harbor. Apart from the finds belonging to the same period as the synagogue, such as the menorah plate (Çevik *et al.* 2010a: 169; Çevik *et al.* 2010b: 173, Fig. 6), recognised as the most important find and which confirmed the identification of the building as a synagogue, there are also many finds recovered from its apse and produced over a timespan from the Hellenistic Period to the Byzantine Period. These finds recovered from the apse fill of the synagogue have no relation with the synagogue, but provide important information about Andriake's commercial routes (Çevik *et al.* 2010a: 170). These finds, examined by our team members and many of which have been published, include oil lamps, plates, amphorae (see: Tomay 2023: 30), cosmetic vessels, glass vessel fragments, terracotta figurine fragments, metal and bone finds, and jewellery (Figure 2) (Çevik and Bulut 2010: 46-7). When the finds belonging to the construction and usage phase of the synagogue were examined, it was determined that the synagogue belonged to the 5th-6th centuries AD (Çevik *et al.* 2010a: 178). There is no stratigraphy in the fill of the Synagogue apse where the gold ring and many other finds were recovered (Özdilek 2017: 338).



Figure 2. Finds of earlier periods uncovered in the apse area (After Çevik *et al.* 2010b: Fig. 20).

Özdilek, in her study examining the DSA Group Ceramics recovered from this area, explains the diversity of ceramics in the area with the suggestion that they may have been brought from a ceramic dump (Özdilek 2017: 335). Among the sigillata recovered from here are Eastern Sigillata group A, B, C, D (Öz 2020: 262-3, Cat. No. 124, Pl. 19:3); Italy, Late Roman C, Late Roman D, Sagalassos, African Red Slip Ceramics and Lycian Region terra sigillatas (Özdilek 2017). The geographical distribution and production date ranges of the lamps recovered from the area are quite wide (see Özdilek 2015). Among the amphorae examined by Tomay within the scope of her doctoral thesis, it was determined that among those recovered from the synagogue apse filling, there are many stamped amphora fragments of Rhodes and Kos origin from the Hellenistic Period and amphora types from the Roman Period (Tomay 2023: 30). The majority of the coins are Hellenistic Union coins, but coins close to the founding period

² For the latest research on Horrea Hadriani, see (Öztürk 2022).

of the synagogue have also been found (Çevik *et al.* 2010a: 170; Bulut and Şengül 2014). The latest coin recovered from the apse fill is of Valentinian II (AD 375-392) (Çevik *et al.* 2010a: 170). The finds recovered from the apse fill were dated to the 3rd century BC to Late Antiquity. The apse fill, in which a wide variety of finds belonging to a long period of time were found, probably consisted of soil leveled from the surrounding area when the apse of the synagogue was being built; In this way, the rich diversity and wide range of finds in the deposit can be explained. In other words, the soil used as a fill here may belong to any surrounding structure or even more than one structure.

Among the materials recovered from the mixed context inside the apse fill is a gold ring with an Eros cameo, which is the subject of this study (Figure 3). When the ring was first found, it was published in various reports and later examined in detail in my master's thesis titled 'Jewels found in Myra and Andriake' completed in 2020 (Çevik and Bulut 2010: 46-7; Çevik *et al.* 2010b: 336; Talu 2020: 76-80, 176-9, Cat. No. 25). Various ceramics recovered from the apse and other areas of the synagogue were also published by our team members (Özdilek 2015; 2017). This article will discuss examples of the depiction of Eros on an amphora and their frequent occurrence in various contexts such as gems, cameos, wall paintings and mosaics, and what this preference means. Questions such as 'Does the meaning of similar depictions differ with the physical context in which they appear?', 'Is it related to similar sea scenes?' or 'Which god/goddess is Eros in these scenes connected to?' will also be discussed. As mentioned above, the fact that the material was recovered from a filling with a mixed context and that it is not related to the structure within which it was uncovered makes it impossible to evaluate the ring contextually, but factors such as the absence of signs of wear on the ring mentioned below enable us to make comments on the purpose of its manufacture. As Ogden points out, signs of wear can indicate whether a piece of jewellery was produced for use or for funerary purposes (Ogden 1992: 8).

Form of the Golden Ring

The form of the gold ring belongs to the Type 3,b group defined by Guiraud (Figure 3) (Guiraud 1989: 185-6, Fig. 21,b).³ The ring has a 'D' section on the shoulder part; it has a rectangular cross section at the bottom. There are deformities in the lower part of the ring. The gold ring's hoop and the bezel were formed as separate pieces and then joined together. The joint trace of the hoop and bezel is indistinct. A cameo made of onyx is affixed. While the stone was being attached, the edges of the bezel part were plastered towards the stone to prevent it from falling, but this part was made carelessly.

In the light of comparative examples, it is known that the ring form in question began to be produced from the end of the 2nd century AD. In addition, a gold ring of the same form found in a sarcophagus from the Myra Stream and other finds next to it also support this production date (Guiraud 1989: 185-6; Talu 2020: Cat. No. 23 and the findings from sarcophagus No. 3). Apart from these, which will be

³ For another example of the same type see (Talu 2020: 72-5, Cat. No. 23).

discussed below, the body shape of Eros also supports our suggestion of a date range between the end of the 2nd century AD and the middle of the 3rd century AD.



Figure 3. Finger Ring of Andriake (After Talu 2020).

Eros Sailing on an Amphora

An Eros depiction on the onyx stone shaped with the cameo technique is used as an ornament on the ring. In the cameo technique, stones such as onyx, sardonyx and nicolo are generally preferred due to their colored veins. The figure or motif to be positively engraved on the stone is shaped from the first color layer to the second color layer by scraping or carving until a background is formed for the engraved figure. In the Andriake cameo, Eros uses the piece of cloth he is holding as a sail and travels forward on the amphora as if he were on the sea. Eros' body is depicted as if he were standing facing into the wind. This stance supports the moving narrative. Eros, who has a changeable personality and is very active, is described by some ancient writers as a god born directly from Chaos (Hesiod, *Theogony*: 120-3). When Aphrodite was born, Eros and Himeros immediately followed her (Hesiod, *Theogony*: 201-2). Eros is described as the oldest and also as love and desire (Homer, *Iliad*: 14. 315, *Odyssey*: 18. 212).⁴ We see him in many ancient sources; he is the subject of many mythologies (see Wissowa 1907: 484-544).

Eros on the Andriake cameo draws our attention with his voluminous body. A rather bulging and bulky structure is observed especially in the calf, hip and belly parts of the body, which is given slightly in profile. Especially the thickness of the left leg immediately catches the eye. The body to head ratio looks rather artificial. In fact, the whole body points to the 'Child Eros' type with its chubby structure. The examples in which Eros is depicted in a child's body appear from the Hellenistic Period and detailed workmanship is not seen in this period (Uygun 2000: 25). Eros' only contoured wings are quite small. He has a large head on his stocky, bulky body. The details of the nose, chin, mouth and eyes on the face are

⁴ See for more (Liddell and Scott 1901: 581).

not very developed. The hair is styled in short tufts but lacks fine details, just like the face. The hands of the child Eros, in which he holds the piece of cloth he uses like a sail, are almost undefined. While the two sides of the fabric are in the hands of Eros, the other end extends to the amphora that carries him. The body composition of Eros suggests the demeanour of one sailing in the wind and shows the moment in every sense in terms of expression.

The depiction is animated and vividly shaped in a way that shows and makes the viewer feel the other elements and figures of the composition despite their absence. Looking at this scene, we feel that there must be other figures accompanying him on the stage. So what is Eros doing here? Is he playing games on the amphora he uses like a surfboard or does he have a place to go? Or is he competing with other Erotes? Or is he running from someone or something? Before looking for answers to these questions, it is necessary to look at the compositions of Eros in gems and cameos, how he is depicted in other areas and with whom he is associated, in other words, the other elements of the composition.

Eros Compositions in Jewellery: Gems and Cameos

Eros, depicted on gems since the Classical Period, has been the main element of many different compositions. In the Hellenistic Period, especially in the 1st century BC, compositions with Eros increased. One of the important distinguishing elements in the depictions of Eros is whether he is depicted as a young man or as a child. When the Classical Period examples are examined, it is seen that Eros is depicted as a young man. The beginning of the depiction of Eros with the body of a child, on the other hand, belongs to the Hellenistic Period. Eros is depicted in many different poses. The most common compositions can be listed as Eros shooting arrows, Eros carrying a torch, Eros depicted riding on various animals, Eros traveling by ship, Eros depicted leaning on Heracles' club or another object, and Eros playing the lyre.⁵ Apart from this, there are also examples where he is depicted with Aphrodite or Psyche. Uygun stated that detailed workmanship of the figures was generally avoided in the Hellenistic Eros depictions, depending on the stylistic features, and only the outer contour was shaped (Uygun 2000: 25).

A study published by Schwartz in 1999 demonstrates that depictions of Eros are frequently used in Roman period ring stones, and they constitute 15 to 20 percent of the total of the depictions of gods among the gems found in excavations in Britain, Xanten, Luxembourg, Gaul, Naples, Aquileia, Caesarea and Cyrene (Schwartz 1999: 13). Hellenistic Period types are mostly used in the Roman era Eros depictions (Richter 1956: 74). Eros shown fishing or performing various actions in the sea are among the preferred compositions in the Roman Period. Actions such as Eros sailing on an amphora or dolphin in the sea or river, or driving a chariot drawn by various animals⁶ are compositions that fit the nature of

⁵ There are many studies in which there are examples with Eros. For some of these, see (Furtwängler 1896: 159-66; Richter 1956: 74-6; Schwartz 1999: Pl. 4-5; Uygun 2016: Cat. No. 2).

⁶ For the dolphin example, see (Uygun 2016: Cat. No. 2).

the god. Examining the cameos and gems with mythological figures in the Silifke Museum, Uygun demonstrates that this iconography can be explained by the constant movement of the god through the example of the gem depicting Eros driving a chariot pulled by dolphins (Uygun 2016: Cat. No. 2). The same situation pertains to Eros, who again exhibits a state of movement by sailing on the amphora. Apart from on jewellery, it is known that in many areas such as sarcophagi, figurines, sculptures, ceramics, mosaics, coins and wall paintings, Eros was depicted hunting, playing games or imitating adults, and in various other actions.

The sailcloth held by Eros on the example from Andriake is also used in other compositions featuring Eros. For example, some of the depictions of Eros traveling with dolphins show the use of a sailcloth. It is seen that mythological characters such as Eros or scenes from daily life are preferred in cameos (Richter 1956: 121). In cameos, just as in gems, in the creation of figures, only the contour is preferred and technical features such as this lack of detail can be followed in terms of dating. As mentioned, there are many examples of gems in which Erotes engage in actions of fishing in the sea, riding mixed creatures, or competing against each other. Four of them are in the Metropolitan Museum of Art and are dated by Richter to the Roman Period (Richter 1956: 75, Cat. No. 313-6). In the first example, Eros rides a dolphin and plays a double flute. Richter stated that this depiction is similar to the compositions on Augustan coins (Richter 1956: 75, Cat. No. 313). Apart from Augustus, this composition can also be seen on the coins of many Roman Emperors such as Antoninus Pius and Caracalla. In the second example in the same catalogue, Eros, riding a dolphin, is holding a bridle and a whip. In the other two he is depicted fishing.



Figure 4. Examples (After Gori 1731: LXXVI).

One of the examples depicting Eros on a boat was found in Tunisia and was dated to the 1st century AD by Spier (Spier 1992: 103, Cat. No. 251). The Eros depiction on the gem is of the child Eros body type, just

like in our cameo example. Three similar gems with depictions of Eros on amphorae are in the Florence Museum (Figure 4) (Gori 1731: LXXVII, I, III, IV). One of these examples is particularly striking as it is almost the same as our Andriake example (Gori 1731: LXXVII, I). In this example, jasper was preferred. Another example, dated to the 1st century BC to around the 1st century AD, is very similar in composition to our Andriake cameo (Furtwängler 1896: 163, Cat. No. 3811).

The scene made using the Intaglio technique is engraved on green glass. Eros, sitting on an amphora on a rough sea, is sailing along. This example actually represents one of the earliest examples of the use of this composition in gems. In the same catalogue, there is a carnelian cameo depicting three Erotes as musicians on a boat (Furtwängler 1896: 345, Cat. No. 11091, Pl. 66). Furtwängler states that on the back of the cameo, Eros is depicted sailing on an amphora and holding a palm branch, but there is no image. The production date of this example is not included in the catalogue. The last example we will examine among the Gems is a find from Caesarea (Hamburger 1968: 14, 32, Pl. IV: 98; Mlynarczyk 2001: 335-6, Fig. 6). In the scene engraved on red jasper, there is a depiction of Eros sailing on a wine amphora. Here, too, Eros sits on an amphora and holds the sailcloth, as in Furtwängler's example. From the swelling of the sailcloth, it may be understood that Eros is in motion. Based on its form, the type of amphora used on the gem, which was dated to the late 1st century BC to 1-2 centuries AD, was identified as Peacock and Williams Class 9 (Rhodian Type) (Peacock and Williams 1986: 103-4).

Meaning: the Dolphin Example

There are many studies on dolphins, which are frequently encountered in ancient written and visual sources. Researchers have discussed the knowledge of ancient people about dolphins, the meanings they attributed to them and their existence in various mythologies in the light of various visual examples. They knew that the dolphin is a mammal and had various communications with them (Ridgway 1970: 88). Dolphins have been depicted on ceramics, figurines, coins, mosaics, jewellery, and more. We know the story of the dolphin that saved the poet Arion (Herodotos, *History*: 1. 23-4; Bowra 1963); In another story, pirates who kidnapped Dionysus turn into dolphins (Ridgway 1970: 88)⁷. Dolphins were closely associated with Apollo, Demeter, Poseidon, Dionysus, Aphrodite and Eros, Nereids and Satyrs (Ridgway 1970). Dolphins also appear in connection with music, death, punishment, redemption, and weather prophecies. All this can also be traced in various fields of visual art and on coins.

So, do the many meanings that the dolphin represents change according to the area they are in and the place or object where they are depicted? The answer to this question actually seems quite simple, but it is indeed complex. The meaning of the dolphin, which will be discussed through the examples with Eros, can be seen simply as being associated with the sea, birth and sensual love in connection with Aphrodite. The dolphin, sacred to Aphrodite, is often depicted with Eros. The active nature of Eros, depicted riding dolphins, has appeared in many areas. Other mixed creatures, crabs and ships that Eros

⁷ See *The Homeric Hymns*, Hymn 7, Dionysus 1. 15.

rides in the sea, that is, on which he travels, can actually be associated with both the nature of Aphrodite and the nature of Eros. So where can we place the amphora at this point? What is the meaning of the amphora in these scenes? Has it simply been replaced by a ship or can deeper meanings be inferred? Why did Eros sail on the amphora and what does this amphora symbolize? Who can it be associated with? Perhaps these questions can be answered based on the scenes on mosaics.

Eros on an Amphora: Mosaics and other Examples

The depiction of Eros sailing on an amphora used in the gem was also used in the mosaics of the Roman Period. Examined examples show that although the Erotes are not the main element of the scenes, they have iconographic connections with them. Apart from these, it can be said that many Erotes are used on the stage as a decorative element, as is frequently seen in other areas. When Roman period mosaics from various parts of the world are examined, we can see that the sea theme is frequently preferred. Erotes, depicted in various actions around, next to or below the gods, goddesses and mixed creatures and other elements that may come to mind when 'sea' is mentioned, add a dynamic image to the scenes and provide movement.

As in jewellery, we also see Eros riding on crabs, ducks, dolphins or mixed creatures and sometimes piloting boats in mosaics. Eros on an amphora, which is the subject of this research, is also seen in these scenes. López Monteagudo states that the Erotes on amphorae are almost 'windsurfing' (López Monteagudo 2011: 454). Indeed, looking at the scenes, the Erotes use the amphorae like a surfboard. All of the mosaics examined by the researcher in the publication titled 'Jugando con las olas. A propósito de un mosaico de Carmona (Sevilla)' are from baths (López Monteagudo 2011). When the scenes on the mosaics are examined, it is seen that Dionysian and floral themes are generally preferred. In the scenes, there are Erotes, mixed animals, fish, structures, plants, geometric motifs and mythological figures. When the mosaics were examined, it was seen that the Eros on the amphora motif was generally used in regions such as Spain, Italy (Lucera, Borghesiana, Rome, Collemancio), Libya (Leptis Magna), Switzerland (Nyon), Antakya (Seleucia Pieria), Tunisia (Sidi Mahrsi), Algeria (Sétif) (see López Monteagudo 2011). These examples were produced in the 2nd-3rd centuries AD, and until the 4th-5th centuries AD.

The first mosaic example is found in one of the panels from the Villa of the Nile, located in a harbour close to Leptis Magna (Figure 5). On the mosaic panel, there are many Erotes engaged in various actions on the river (Versluys 2002: 114 *et seq.*; López Monteagudo 2011: 463-4, Fig. 12). In this very lively scene, there are Erotes entering the harbor in a boat, dolphin riders with whips in their hands, and fishermen. However, the most striking figure among them is the figure of Eros who sails on an amphora and sails swiftly behind a boat. The figure is depicted as the child Eros, just like in our cameo. Considering the body features, the thick legs and bulky body of the mosaic figure draw the attention. The port structure depicted in the mosaic is thought to be the Temple of Jupiter Dolichenus (Versluys 2002: 114 *et seq.*). In the mosaic samples in question, there is a figure resembling Bacchus at the bottom, while a Nereid

accompanies Eros, who is sailing on an amphora. Here, the amphora that Eros rides is defined as a wine amphora (López Monteagudo 2011: 455-8). Becatti traces the origin of the figures sailing on the amphora to the Hellenistic Period (Becatti 1961: 312, Note 149). As mentioned, the earliest examples among the gems were dated to the 1st century BC/1st century AD by Furtwängler (Furtwängler 1896: 163, Cat. No. 3811). In the Lucera mosaic, there is a scene full of elements related to the sea (López Monteagudo 2011: 458-60, Fig. 4-5). Apart from these examples, there are hunting scenes, as well as a mosaic where Eros - or in this instance, a pygmy - escapes a hippopotamus by sailing on an amphora (López Monteagudo 2011: 461-3, Fig. 11). When the mosaic in question is examined, it is seen that Eros/the Pygmy has turned his head back towards the hippopotamus, and this supports the idea of escape. On the mosaic in Sétif, with Eros on a dolphin offering a crown to Aphrodite, Eros is depicted sailing on an amphora, the type of which can also be defined as a wine amphora (López Monteagudo 2011: 468-9, Fig. 19). In Seleucia, he appears with Thetis (Buddé 1972: 85-6; Cimok 2000: 195; López Monteagudo 2011: 465-6, Fig. 15-16).

When these examples are examined in general, Erotes sailing on amphorae are most frequently found as part of the following compositions:

- 1) With goddesses (such as Aphrodite, Thetis, Nereids)
- 2) With gods (such as Dionysus)
- 3) Harbour scenes
- 4) Nilotic, floral scenes (such as hunting scenes)
- 5) Scenes of everyday life (such as fishing scenes)



Figure 5. Mosaic Panel from the Villa of the Nile (After <<https://www.livius.org/articles/place/lepcis-magna/photos/lepcis-magna-villa-of-the-nile-mosaic/>>, viewed 10 June 2023).

In all of these scenes, we see situations of the same form, which have different meanings with the change in contexts and figures. The amphora, which is used as a ship or surfboard to escape from an animal in one hunting scene, is used for traveling or racing in another place. In association with Dionysus, the

emphasis is placed on the god and on the wine amphora; his relationship with the goddess and therefore the sea is emphasised by an association with Aphrodite, together with Erotes, who ride dolphins and other creatures. Apart from jewellery and mosaics, it is known that this scene was also used in plaster-work (López Monteagudo 2011: 458, Fig. 3). But is it always possible to distinguish the meanings?

While it is relatively easy to interpret examples such as mosaics where there are different figures in the scene and usually a narrative, it is quite difficult to make a suggestion or to attribute the scene to a god/goddess for single-figure scenes on gems or cameos. This becomes more difficult, especially for examples that do not have a specific find context, such as the Andriake finger ring. This design, which interestingly conveys the character of the mischievous and playful Eros floating on an amphora through the waves, and his relationship with the sea in terms of his relationship with Aphrodite, fits the character of Eros quite well. On the other hand, as suggested by the researchers, the hint of wine in the amphora and the relationship with Dionysus and Dionysos with the sea and Eros are undeniably important. The use of this depiction of Eros in jewellery is less common than in mosaics. In the case of Andriake, the fact that there is no trace of use on the ring and that the diameter of its hoop is too small to be worn indicates that it was not intended for use. Although the original find spot, for it was discovered in the fill of the apse of the synagogue building, is not known, there are structures such as the Horrea Hadriani, workshops, port structures and tombs around it.

It is thought that the soil brought here and used as a fill during the construction of the synagogue's apse was collected from the surrounding area. Considering that the finger ring was not used, it may have been left as a funerary gift. However, considering the available data, these comments cannot go beyond a recommendation. The Andriake ring with Eros, which belongs to the end of the 2nd century AD or to the middle of the 3rd century, is a good example of this theme; it also constitutes a good example of the composition being used on cameos. It is symbolically striking that such a lively scene, which belongs to the sea and evokes the sea, was discovered in Andriake, an important port city. This may help us form thoughts about who it was made for.

Apart from all these, the publication and interpretation of different examples will also contribute to our suggestions and questions about the scene in question. In this study, the 'child eros sailing on an amphora' depiction, which is an undeniable reflection of the active nature of Eros, was examined together with the compilation of comparative examples. It should not be overlooked that there is a difference between them in the interpretation of the areas where the scenes are selected and used. When all the data are evaluated, the most likely scenario is that the first place where this specimen was left was a grave, and that therefore it was a burial gift. It is also a feature of the Andriake ring that this scene, which we see in mosaics and gems shaped in the intaglio technique, and to a lesser extent on plaster work, is a good example shaped in a cameo technique.

Catalogue of the Finger Ring with Cameo
Hoop diam.: 1.8cm Cameo diam.: 1.2-1.1cm Weight: 1.94gr Find location: Andriake, Synagogue, Apse, -115cm Material: Gold and Onyx? Technique: Shaping gold sheet, stone inlay, cameo. Production date: Late 2nd century AD - 3rd century AD.

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Heritage Management, Technology and Outreach

The ‘Time-Traveller’ Visits Minoan Crete:

An Innovative Museological Project

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Abstract

The aim of this paper is to present an innovative museological project: the potential for a group of students, pupils, tourists or any kind of visitors to the island of Crete to ‘travel through time’ and experience the days when the Minoan palaces thrived and the Minoans were the dominant sea power. This project constitutes a unique approach to the pages of prehistory that cover the Minoan Era at its peak (15th century BC). It is based on the dramatization of a historical scenario (based on historical and archaeological evidence) and role-playing, supported by multimedia applications. Through this educational-cultural program anybody can become a ‘time traveller’ to the Late Minoan period and pay a visit to some of the Minoan palaces and towns. In this way the regular tour of monuments is transformed into an adventurous journey to the past of Minoan Crete, where everybody can play an active role.

Introduction

Minoan Crete: an island full of myths, history and culture that especially in the greater part of the 2nd millennium BC had a dominant presence. A very fertile place at a uniquely strategic position in the Mediterranean Sea which favoured the ‘Minoan Thalassocracy’ and close contacts and commercial transactions with the dominant powers of the era (Egypt, Syria, Cycladic Islands, Mycenaean Kingdoms etc.). Larger and smaller Minoan palaces and villas in Knossos, Phaistos, Malia, Zakros, Kydonia etc housing the ‘King’, the ‘Queen’, the ruling aristocracy and a very well-organized administrative system, along with the Minoan houses, workshops and shrines at Knossos, Malia, Gournia, Palaikastro etc. composed the so-called Minoan civilization. By serendipity and thanks to the indefatigable efforts of archaeologists a wealth of architectural remains and other archaeological finds have been brought to light testifying to its cultural grandeur!

An innovative museological project has been masterminded for an unforgettable visit all over the island of Crete. It is intended for tourists, pupils, students or any kind of visitor to its ancient sites who would enjoy travelling through time following a specific scenario of the educational-cultural program. Indeed,

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anybody can end up joining our 'time traveller' in their tour around the Minoan palaces of Crete. The present study deals with, firstly, the theoretical context that favored the conception of this project and the general principles of design of educational-cultural programs and, secondly, the special characteristics of the specific program.

New Trends in Tourism, the Management of Culture and Museum Education

When did tourism really begin? According to Encyclopaedia Britannica '[its] history begins long before the coinage of the word "tourist" at the end of the 18th century, since in the Western tradition, organized travel with supporting infrastructure, sightseeing, and an emphasis on essential destinations and experiences can be found in ancient Greece and Rome, which can lay claim to the origins of both "heritage tourism" (aimed at the celebration and appreciation of historic sites of recognized cultural importance) and beach resorts'.⁴

Why did people travel back then and how did this evolved into 'heritage' or cultural tourism? In the beginning, the development of the civilizations in Ancient Mesopotamia led to movements of groups of people for various reasons: commercial, political, cultural or educational. The first recorded trips that combined entertainment with education go back to Pharaonic Egypt and were executed by privileged groups of the population. The Minoans travelled for commercial reasons and indirectly for expanding their knowledge on different aspects, while the Mycenaeans did so in a more aggressive way for expansion of their territory. The Mayas or members of the Shang Dynasty travelled to see what was beyond their own borders with the desire, of course, to spread their civilisation. Similarly, the Phoenicians travelled not only to develop trade routes but also because of curiosity, since they had a desire to discover what lay beyond their area of the Mediterranean. Herodotus of Halicarnassus, the so called 'father of history' (of Ancient Greece) constitutes a great example of a 'cultural-educational tourist'.

Herodotus was indeed a well-travelled person with an interest in both history and ethnology who visited Egypt, North Africa, the Black Sea, Mesopotamia and Italy, pioneering a new type of research trip and now also acknowledged as 'the father of tourism'. In Ancient Greece and later in Ancient Rome many different aspects of tourism became very popular. For example, religious journeys to Delphi or Eleusis, athletic trips to Olympia or Nemea, educational-philosophical visits to Alexandria, Samos or Miletus, and cultural trips to Epidauros make up the first examples of cultural tourism. The Seven Wonders of the World (i.e. the Temple of Artemis, the Hanging Gardens of Babylon, the Mausoleum at Halicarnassus, the Colossus of Rhodes, the Statue of Zeus at Olympia, the Great Pyramid of Giza, and the Lighthouse of Alexandria) can be considered as 'tourist sites' for educational-cultural tours of Greeks and Romans. Then, in the Middle Ages religious and cultural tourism flourished, since through the Crusades and pilgrimages people from different countries attempted to travel to Jerusalem, while other individuals

⁴ <<https://www.britannica.com/topic/tourism>>.

planned educational trips to the great universities of Oxford, Cambridge and Montpellier. The term ‘tourist’ is used for first time in 18th century England to define a person that participates in a grand ‘tour’ for different reasons. Nowadays, tourism constitutes a social-economic phenomenon that is based on the human need for recreation, getting in touch with nature, and getting to know new places and new cultures (Gyr 2010; McIntosh *et al.* 1995; Τσάπρας 1996).⁵

McDonald and Jolliffe (2003: 307-10) claim that ‘tourism and culture are multidimensional concepts that are correlative’. According to the definition adopted in 2017 by the United Nations agency for World Organization of Tourism (UNWTO): ‘cultural tourism is a type of tourism activity in which the visitor’s essential motivation is to learn, discover, experience and consume the tangible and intangible cultural attractions/products in a tourism destination. These attractions/products relate to a set of distinctive material, intellectual, spiritual and emotional features of a society that encompasses arts and architecture, historical and cultural heritage, culinary heritage, literature, music, creative industries and the living cultures with their lifestyles, value systems, beliefs and traditions’.⁶ That is to say cultural tourism - which is directly related to the present study - is a category of ‘knowledge-based tourism’ in which the visit to a place is instigated by the cultural characteristics of the particular region. It denotes the tourist’s ‘nostalgia for the past’ and their wish to study the way of life of the inhabitants of a place through the years, from past to present. Cultural tourism consists of visits to historical-archaeological sites and museums, attendance at local festivals etc. and aims at the enrichment of the cultural status of the tourist with new experiences and knowledge (Bescuilides *et al.* 2002: 310; Kennedy 2002: 1038; Poria *et al.* 2001: 1047-9; Richards 2001; Zeppel and Hall 1992).

Evidently, it can be suggested that cultural tourism embraces creative tourism, educational tourism, archaeological tourism, religious tourism, volunteer tourism, gastronomic tourism etc. and in the opinion of the Vision Study of the World Organization of Tourism (WTO) for 2020 would be (but for the pandemic of COVID-19) one of the five most appealing touristic products. It is worth mentioning that this category of tourism is seen as highly desirable by many destination countries and cities, since it means the arrival of tourists of high educational level willing to spend substantial sums of money on cultural activities which can easily be invested in the preservation of Cultural Heritage (Bowitz and Ibenholt 2009: 6-7). Obviously, this fact instigates countries to try to offer competitive touristic products, which according to the Ritchie/Croutch Conceptual Model of Destination Competitiveness (Ritchie and Croutch 2003) should have the following basic characteristics: increase of touristic investment, increase of attractiveness to visitors/tourists, contribution to the rise of the local standard of living, providing tourists with satisfactory and unforgettable experiences in well-preserved archaeological sites and modern organized museums, which together will provide a profit for the destination. The convergence between tourism and culture, and the increasing interest of visitors in cultural experiences, obviously bring unique opportunities.

⁵ <<https://tourismteacher.com/history-of-tourism-2/>>.

⁶ <<https://www.unwto.org/tourism-and-culture>>.

However, at the same time complex 'challenges' for the tourism sector and the local authorities arise. The UNWTO clearly lays emphasis on the fact that 'tourism policies and activities should be conducted with respect for the artistic, archaeological and cultural heritage, which they should protect and pass on to future generations; particular care should be devoted to preserving monuments, worship sites, archaeological and historic sites as well as upgrading museums which must be widely open and accessible to tourism visits'.⁷

The growing demand by tourists for unique experiences in well-organized cultural places was one of the important factors that instigated significant changes in cultural management. First, in 2007 the International Council of Museums (ICOM) produced a definition of the museum stating that 'a museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and recreation' (Desvallées and Mairesse 2010: 57). Following this concept, museums and archaeological sites - which earlier were attracting mainly specialists - under social and political pressures opened to the public, realized their role as an educational mechanism, and started making efforts to become more visitor focused (Vergo 1989: 1). Moreover, very recently, on 24 August 2022, ICOM adopted a new museum definition that is 'broader' in a certain way since it clarifies that: 'a museum is a not-for-profit, permanent institution in the service of society that researches, collects, conserves, interprets and exhibits tangible and intangible heritage. Open to the public, accessible and inclusive, museums foster diversity and sustainability. They operate and communicate ethically, professionally and with the participation of communities, offering varied experiences for education, enjoyment, reflection and knowledge sharing'.⁸ In order to meet the requirements of their new role new museums are built, existing museums are being renovated to accommodate exhibitions designed to modern museological standards, and archaeological sites are being restored, while communities now are invited to participate. Consequently, cultural places are transformed into ideal sites for cultural tourism and modern museum education.

The traditional model of museum pedagogy, which simply offered access to tangible and intangible cultural heritage through typical information, is refuted. The new humanistic didactic model fosters educational activities in a museum environment, the main purpose of which is to impart knowledge to the visitor. As a result 'new generation' educational-cultural programs are masterminded aiming to give emphasis to the interaction of people and culture with an 'open' effect that can be determined by the interests and expectations of any individual (Allard and Boucher: 1998; Desvallées and Mairesse 2010: 31; Girtzi and Bountidou 2012; Μπούνια 2010). The design and implementation of this type of educational program is considered by Φουρλίγκκα and Βεροπουλίδου (2020) as 'an experience worth trying while the difficulties that arise should be creative challenges, motives for finding new alternatives'.

⁷ UNWTO, Framework Convention on Tourism Ethics, Article 7.2: <<https://www.unwto.org/tourism-and-culture>>.

⁸ <<https://icom.museum/en/resources/standards-guidelines/museum-definition/>>.

These programs are designed by several different cultural or educational organizations, following similar general principles stated below. In the first place, the topic is to be selected taking into consideration various criteria (i.e. pedagogical, educational, scientific, cultural and social). In this procedure there are two main aspects that must be defined from the beginning: the target group - so as to adjust the topic to their age and cognitive level - and the artifacts of the museum or the monuments of the archaeological site to be examined. Then, the techniques for the implementation of the program's educational activities must be decided. The designer can choose from a number of options, such as dramatization of a historical scenario, role playing, narration, guided discussion etc., supported usually by computer applications (Καρυδά 2006; Νικονάνου 2009).

A common goal of the modern museological educational projects is the active participation of the visitors in the comprehension of culture and the building of knowledge. In this way, historical knowledge can be affiliated with both past and future, making the participants realize that 'understanding the Past offers them the potential to comprehend the Present' (Apostolidou 2020; Girtzi and Bountidou 2012; Girtzi and Bountidou 2013; Girtzi and Bountidou 2016; Girtzi and Bountidou 2018; Girtzi, *et al.* 2019). The project *The 'Time Traveller' Visits Minoan Crete* - which will be taken as a case study in what follows - complies with the above-mentioned principles.

The 'Time-Traveller' Visits Minoan Crete: an Educational-Cultural Project for the Minoan Archaeological Sites of Crete

Greece has faced many 'challenges' through the past 20 years. The serious economic crisis of the first decade of the 21st century caused the country huge economic problems lasting for many years ahead. However, studying the statistics⁹ it seems that this crisis did not affect tourism at all. On the contrary, every year the number of foreign travellers visiting Greece forms a new record. Namely, in 2019 more than 30 million tourists visited Greece, in contrast to the 15 million of 2010 or the 6.2 million of 1998. Greece has been the European destination with the biggest increase in visitor number during the last decade. Everything changed in March 2020 unexpectedly when the COVID-19 pandemic broke out. The immediate lockdown that was put in place in Greece among numerous other countries (which would have been the source of tourists) and the travel restrictions imposed in the above countries affected tourism severely. Cultural-educational trips especially were banned.

The numbers of incoming tourists to Greece this time dropped precipitously. As a result, in 2020 only 7.3 million arrivals in Greece were recorded without clear touristic intentions for all of them. In February 2021, when the pandemic was still ongoing, but the situation was then under control, UNWTO invited UNESCO to contribute to a set of guidelines relating to the sociocultural impacts of COVID-19 in cultural tourism. The two UN agencies tried to analyze the impact of the pandemic and suggest solutions for cultural tourism to prosper again, under the principles of shared responsibilities and greater

⁹ <<https://www.unwto.org/tourism-statistics>>.

inclusion (WTO 2021; WTO 2021a). The results of these attempts along with those of the EU and Greek authorities did make a slight difference initially since in 2021 14.7 million tourists visited Greece (double that in 2020). From then onwards tourism seems to have restarted properly, since in 2022 the number was again almost doubled, with 27.8 million tourists. Moreover, the predictions for 2023 and even 2024 are very optimistic for an outburst of tourism including a great share for cultural-educational trips.

The common trend is still that the majority of travelers head to the Greek Islands, especially the southern Aegean ones, Crete, or Athens. This is evident in the numbers as well, since according to the statistics of the Greek Tourism Confederation (INSETE) Crete accommodated in 2019 5.5 million visitors, in 2021 3.4 million (half of the number of tourists of Greece for the period of pandemic) and in 2022 5.6 million.¹⁰ Having a very adequate transportation network (2 airports, 4 ports, newly established roads), directly connected to the capital of Greece, Athens, (via air or sea) and simultaneously offering a great variety of accommodation (by the endless beaches and/or in the mountainous resorts) and extremely interesting and diverse sightseeing (exceptional archaeological sites, historic churches and monasteries, listed stone villages etc.) it has been one of the most popular islands of Greece in terms of all year round tourism. In fact, the area's continuously upgraded infrastructure, the development of highly imaginative thematic travel products and the promotional activities run by the Ministry of Tourism and the regional authorities have ensured that tourism in Crete is gaining momentum with great prospects for 2030.

Crete, located in the southern side of the Aegean Sea, is the largest island in Greece, and the fifth largest in the Mediterranean. It is a place with 'natural beauty meeting rich culture and worldwide famous gastronomy, to create the most dreamy holiday paradise!'.¹¹ The official site of the Ministry of Tourism cites 10 reasons why Crete is worth visiting:

1. Civilization and culture (the Minoan palaces at Knossos, Phaistos, Malia and Zakros; the archaeological sites of ancient Gortyna, Eleftherna, Lyttos, Aptera, Falasarna, Spinalonga; the Venetian harbors at Chania, Heraklion and Rethymno; the Ottoman monuments and architectural structures seen across the island; the historic monasteries of Arkadi, Preveli, Toplou, Agarathou, and Chrysoskalitissa; numerous thematic museums).
2. Old towns (the old towns of Chania and Rethymno with their fascinating combination of Venetian and Ottoman architectural elements).
3. Traditional villages (mountain villages, mostly, such as Archanes, Zaros and Asites in Heraklion region, Vamos and Chora Sfakion in Chania region, Anogeia, Axos and Margarites in Rethymno region, Makrygialos and Kritsa in Lasithi region).
4. Seaside tourist resorts (luxury resorts and lodgings of all types can be found along the seafront).

¹⁰ <<https://insete.gr/statistika-deltia/>>.

¹¹ <<https://www.greeka.com/crete/>>.

5. Gastronomy (the essence of the Cretan cuisine can be described in the following words: ‘prefer the products of your land’, such as seasonal fruits and vegetables, legumes, wild edible greens and fragrant herbs, goat and sheep meat, local cheeses, local wines etc.).
6. Beaches (the island’s endless coastline features numerous beaches, most of which are sandy).
7. Nature’s amazing creations (high mountains with rugged peaks, caves and ravines, fertile plateaus and valleys, rare cedar forests and water habitats).
8. Activities (hiking, trekking, diving, sea kayaking, windsurfing etc.).
9. Paradise islands (Gavdos islet, the southernmost tip of Europe, Chrysi or Pontikonisi islet, Koufonisia etc.).
10. A Natural way of life (Cretans being the descendants of Cretan-born Zeus, the god of hospitality, know how to offer hospitality. Their profound love for their homeland and their adherence to traditional ways and customs have shaped a special culture and a way of life that is absolutely worth discovering).

All 10 reasons are really attractive for any traveller and especially so for the ‘cultural traveller’; according to the Ministry of Tourism ‘once you get there though, expect to discover many more!’.¹²

Crete is a place full of myths (such as birth of Zeus, Zeus-Europa, King Minos, the Minotaur etc.) and history. Its strategic location on the map has made the island a crossroads where different people and civilizations have met and shaped Crete’s identity. During the 4000 years of recorded history Minoans, Mycenaeans, Ottoman Turks, Arabs and Venetians have left a permanent mark on the island and a very rich cultural heritage. Temporary habitation of Crete actually, according to the discovery of some stone tools, goes back to 130,000 BC; however, permanent settlements on the island date to 6500 BC. By the beginning of the 3rd millennium BC in the Bronze Age the so-called ‘first European civilization’, the Minoan, emerged there. The first thousand years have not produced much evidence to shed light on a thriving civilization. Nevertheless, by 2000 BC onwards Minoans appear dominant and prosperous building huge and very well organized ‘palaces’ at many sites, such as Knossos, Phaistos, Malia, Zakros, Kydonia as well as towns like Gournia. They produced striking sculptures, frescoes, pottery, jewelry, and metalwork and they were great traders, as the term ‘Minoan thalassocracy’ and the archaeological finds all over the Mediterranean Sea attest. They were also innovative in many other ways, since they developed their own writing (Linear A), printing writings, and complex water systems and installations. It must be emphasized that women played an important and active role in the life of the palace. The Minoan palaces and other sites were affected by many disasters, one being the eruption of the volcano of Thera in the late 17th – early to mid-16th centuries BC, but they survived and were rebuilt on some occasions. However, from the 15th century BC onwards, the Minoans started losing ground to the rising power of the Myceneans. The latter along with series of natural disasters and internal upheavals led to

¹² <<https://www.visitgreece.gr/islands/crete/>>.

the destruction of almost all the palaces by 1450 BC, apart from Knossos which survived, probably as the seat of the Mycenaean governors, until the collapse of the Mycenaean Kingdoms, along with other mighty Kingdoms all around the Mediterranean in 1200 BC.

The truth is that for centuries it was believed that the Minoans were part of mythology and thus a figment of the imagination. However, in late 19th century, when Crete was still under Ottoman occupation, a local businessman and amateur archaeologist, Minos Kalokairinos, performed the first excavations in Knossos. Thus, he produced the initial evidence that this unique civilization, that soon enough the next excavator, Sir Arthur Evans, would name 'Minoan civilization', not only existed but also thrived for centuries, creating a legacy! From then onwards, the Greek Ministry of Culture in collaboration with various Foreign Schools (British School at Athens, American School, Italian Institute, French School) have run excavations all over Crete, bringing to light the Minoan palaces, Minoan towns etc.¹³ (Andreadaki-Blasaki 1997; Chadzi-Vallianou 1998; Δαβάρας 1989; Davaras 1989a; Davaras 1989b; Vasilakis 2015; Vasilakis 2015a; Δεσούπρης, Langrnfas and Σαντορινιάου 2001).

Regarding tourism, it is noteworthy that the majority of the visitors to Crete tend to travel all around the island, finding it ideal for cultural tourism. In fact, they tend to especially choose destinations where Minoan palaces stand, since the archaeological remains and finds of the Minoan Era constitute the major cultural attraction. In order to satisfy this demand, the Greek Ministry of Culture is carrying out excavations and restoration works in many of the Minoan sites. Moreover, both the Greek Government and the Local Authorities offer a very rich program of events (including information and educational events, musical and theatrical performances, exhibitions etc.) and educational programs, and issue publications supporting the promotion and presentation of those unique archaeological sites to the public facilitating a multi-level approach.

The Time-Traveller Visits Minoan Crete project is intended to add value to these efforts in an alternative way. From this starting point, it constitutes an attempt to initiate cultural tourists, students or any other visitor into aspects of the daily life of the Minoan Era in Crete, the land where the Minoan Civilization was born and flourished in a number of palaces and towns. It is an educational-cultural program that employs dramatization of historical scenarios (based purely on historical and archaeological evidence) and roleplaying (with a distinctive role for each participant for up to 20 persons) and is supported by multimedia applications. The scenario takes place in a series of sites. The 'traveller' lands in eastern Crete, at the palace of Zakros, then moves north to the town of Gournia and heads to the palace of Malia. From there he goes first south to the palace of Phaistos, soon to return north, to the palace of Knossos. He concludes his journey in western Crete, leaving the island from the palace of Kydonia. The project can initially be presented interactively in a conference room of one of the adjacent resorts, a classroom or an amphitheatre with a power point (combining text and image, animation, 3D graphics and other

¹³ <<https://www.britannica.com/place/Crete>>.

effects) and then applied in real simulation in situ on a unique journey to the past. The scenario of the program is recorded below.

‘The Time-Traveller Visits Minoan Crete’

In order to satisfy the program’s requirements, the participants are assigned with various roles - described below - and we travel back to the 1500s BC, when the consequences of the eruption of the volcano of Thera have been ‘mitigated’ and the Minoan palaces have been lavishly restored and even rebuilt. The story starts with the time traveller landing initially in Cyprus with the goal of finding somebody to join him in his new mission: to visit the Minoan Palaces ‘undercover’ and check how they have adapted to the circumstances post-eruption. He is lucky since he meets a fisherman who comes from Thera. The latter belongs to a prominent family descended from Cretans that migrated to Thera about two centuries ago. The fisherman has been wise enough to abandon Thera and settle on adjacent Cyprus just before the great eruption. Having lost everything and everyone from Thera, he has come up with the idea of traveling to Crete to find his roots, any relatives remaining there, and even to move there if the circumstances are favorable.

So, they sail together for their first stop to Crete, the Palace of Zakros. Zakros lies at the eastern end of the island, being an important trading post that is exploited by the major palace of Knossos. The Traveller and the fisherman have information that the antecedents of the former had a long tradition of being great craftsmen working with precious materials; thus, they consider that they are at the right place to start since the Palace of Zakros is very famous for the unique workshops that accommodate not only storerooms -in fact ‘treasuries’- of unique raw materials (such as elephant’s tusks, faience, rock crystal, steatite, gold etc.) but also some very skillful craftsmen working with those materials creating masterpieces for the Palace of Knossos or/and others. The Minoans prove that they are peaceful and hospitable and welcome them. Being proud of their small but lavishly decorated palace they show the distinguished guests (as they consider the traveller and the fisherman) around the palace. Their host explains that all around Crete they build palaces following similar principles. Firstly, he shows them the West court in front of the Palace that is intended to be used for feasts and includes the main entrance. Then he lets them in through a series of quite confusing corridors - that indeed resemble a labyrinth - and leads them to the main court, which is surrounded by numerous rooms with special functions (economic, religious, administrative, residential etc.). To impress them the host shows the magazines where they store some of the surplus wine, olive oil, grains etc. in huge decorated vases (pithoi), and he leads them to the rooms of the ‘Queen’ and the ‘King’ who give them permission to visit the store rooms with their precious raw materials and, of course, the workshops of the distinguished craftsmen. The fisherman, seeking information about his relatives, learns that they actually know one of them. However, he has just left for Malia to meet some craftsmen specialized in precious seal-stones and learn some of their techniques. As a result, after a great dinner that their hosts offer in the ‘symposium room’ over the kitchen, the traveller and the fisherman sail for Malia.

They first reach the Minoan town of Gournia where they spend the night. Early in the morning, they participate in a unique ritual around a sacred baetyl, and then they are shown around to see how a city is organized, with two-storey stone houses that accommodate many families. They are even invited to one of them to try the unique wine that the host is making in his own wine press. Then they depart for Malia where they are also welcomed in the Palace. They cross the western court and they enter from the northern gate having first to place an offering at the *kernos* that lies right next to the main entrance. They are shown around the Palace confirming what they have been told previously; this Palace is also labyrinthine in layout and has the same features only at a different scale. They stop at the main court with its altar to make their own sacrifices; they visit the huge and very wealthy magazines where plenty of wine, olive-oil, honey, grains are kept; they are led to the 'King' and the 'Queen' who grant them permission to enter the quarter of the craftsmen. They are really surprised by the quality of the houses of the craftsmen in their special quarter that proves that they enjoy a special status. Their surprise is even greater at the quality of the artefacts that they are producing there, especially the carved seal-stones made of precious and semi-precious stones and some unique pieces of golden jewelry such as a fantastic bee pendant. However, although the fisherman's relative had been there he did not stay for long, for he was informed about a very important potters' competition taking place in those days in Phaistos that he had always wanted to attend. Consequently, the traveller and the fisherman realize that their next stop will be Phaistos. In order to save some time, they leave their ship to sail to Knossos, where at least the traveller must pay a visit, and, riding horses, they travel to the southern part of the island.

After a quite long and tiring journey they reach the very fertile Messara plain and the really dominant Palace of Phaistos. They are welcomed at the western court of the Palace where they are informed that the very famous pottery festival was hosted the previous couple of days. They can see the huge pottery kilns and some of the greater examples of the local lavishly decorated pottery, which is distinctive due to the clay of the 'sacred' Kamares cave. Nevertheless, the fisherman's relative - having been one of the winners of the competition - has departed for the central Palace of Knossos to serve there as a prize. The traveller and the fisherman have a quick 'tour' of the Palace - so as to fulfil the former's mission - noticing that this Palace is even greater than those in Zakros and Malia but based on the same plan and philosophy. They are really impressed by the size and the contents of the magazines, the masons' marks on the walls that are really mysterious, the nice decoration of the 'sacred' rooms and of the quarters of the 'Queen' and the 'King'. The latter showing his trust in the traveller, asks him to deliver a secret message on a clay disc with awkward symbols to the 'King' of Knossos. After a great feast in their honor and a good night's rest they must ride their horses to Knossos.

They arrive almost in the middle of the northern coast of the island, a few kilometers inland, where Knossos is located. Coincidentally, a small feast is taking place in the west court, where beautiful women seem to welcome them with a traditional dance. They enter the Palace - which they soon realize is the epitome of the labyrinth with all the features that by now they can easily identify - from the southern entrance and they wholeheartedly admire the magnificent frescoes on the walls. They visit the 'King' in his quarters delivering the cryptographic message from Phaistos, then the quarters of the 'Queen'

where they are stunned by the beautiful dresses of the ‘Queen’ and her attendants. Shortly afterwards, they are led to the main court, which is already occupied by hundreds of Cretans. They first participate in the sacrifices led by the ‘High Priestess’ who appears in front of the tripartite shrine holding snakes. Then, they have the unique chance to attend the great festival that includes ‘bull-leaping’. After this completely unique experience, they try to locate the fisherman’s relative; they are told that the ‘King’ himself has sent him to the ‘King’ of Kydonia with a special mission. Both the traveller and the fisherman realize that in order to complete their missions they will have to sail for the last of the palaces on the northwestern coast of Crete.

Soon, they arrive at Kydonia, where the great ‘King’ welcomes them to his relatively smaller but still impressive palace standing on a hill. While the sun is about to set, offering a great sunset at the western palace of Crete, it becomes clear that both their missions have been accomplished, and it is about time to follow different directions. On the one hand, the fisherman at last has met his relative and he wants to share many things with him; this ‘reunion’ with his past makes him think of moving permanently to Crete, which he really appreciated during this tour. On the other hand, the traveller has now a global view of the post-eruption circumstances in Crete, which seems to have left behind the disasters and is now thriving again. It is time for him to depart and get ready for his next adventure.

Conclusions

Evidently, the educational-cultural program of the ‘time-traveller’ offers a unique opportunity to cultural tourists or students from all over the world to become familiar in an interactive way with aspects of the Minoan Prehistory of many archaeological sites of Crete, which were inhabited by people that dominated the Mediterranean Sea for many centuries. In this project is achieved what Μπούνια (2010) thinks is elementary for a ‘new generation’ educational-cultural program: ‘learning is perceived as a creative dialogue and not as a passive transmission of knowledge’. Through the historical scenario the participants have the chance to actually experience civilization, which according to Coccossis and Nijkamp (1995) ‘constitutes a human activity, an expression of the human mind in material (e.g. monuments) and immaterial form (e.g. music, literature, poetry) that provides a living context from the past for the present and the future’.

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Collection and Analysis of Web Resources for Underwater Cultural Heritage

Lucrezia Maghet¹

Abstract

There are various types of digital resources dedicated to underwater archaeology on the web, which are not only a useful tool for professionals in the field, but also a considerable means of dissemination to the general public, since access to submerged cultural heritage is often limited. However, although the promotion and fruition of cultural assets have certainly been optimised by the resources available online, the web is not always a reliable source from which to draw or verify information. Therefore, this study offers some criteria for evaluating the reliability and usability of content on the Internet. In addition, a sample of the most interesting digital materials and resources related to underwater archaeology, found on 160 websites, is presented. These were collected and analyzed, starting with the Italian case.

Introduction

The presence of archaeology on the web has been growing in parallel with the development of Internet technologies (D'Eredità *et al.* 2016; Moscati 2019), whose benefits are being taken advantage of not just by archaeologists for research purposes (D'Andrea 2006: 15-33), but also for the divulgation of their studies to a wide audience (Moscati 2011: 273-6). In particular, education and dissemination of underwater cultural heritage (UCH) to the general public relies greatly on digital resources (Sanders 2011), given the well-known obstacles that prevent its widespread enjoyment *in situ*, such as the environment in which the sites are located - which requires a diving licence -, sometimes difficult access (e.g. due to their depth) (Drap 2012; La Rocca and Emma 2018), often restrictive legislation or, in most cases, the intrinsic fragility of underwater archaeological sites (Hafner *et al.* (eds) 2022).

However, while digital materials have become an irreplaceable tool - due to speed of dissemination and access to a wider and more diverse audience (Bogdani 2019) - they are subject to the limits of their trustworthiness. Since anyone can now use the web for personal purposes and create their own content, the average user, who has no academic training or only superficial knowledge, is not always able to adequately assess the reliability of information - in our case regarding underwater archaeology -, which is sometimes presented as scientific (Campbell 2018: 104-20). So, the purpose of this investigation was

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to check what are the most useful and reliable resources for the field through what is present on the Internet.

The study depicted briefly in this paper was conducted between December 2021 and April 2022 on sites covering underwater archaeology, collected and analysed for the author's undergrad thesis. It, therefore, focused on traditional systems of retrieving information on the Internet, that is through websites and webpages, excluding social media outlets and content implemented or created by artificial intelligence. In fact, when this study was conducted generative AI hadn't already become a part of our everyday life, and it was not widely used by the general public.²

Methodology

The search on the Internet was initially carried out using keywords in both Italian and English (i.e.: underwater archeology (UA), academic courses in UA, underwater cultural heritage (UCH), UA museums, etc.). A census form has been created, where the main data of each of the sites explored have been recorded, including their URL, which keyword(s) was used to find them, country of origin, property - divided into public or private (Figure 1) -, main language and available ones, category of site related to the main topic (see *infra*), a brief description, inclusion of multimedia content (images, videos, audios etc.), presence of internal and external links (e.g. to social media and online stores, or to other sites), services offered (such as membership, newsletter), and evaluation of the site. The last item on the form provides a personal rating (from 0 to 5 per category) for every website visited, based however on the fulfilment of some objective parameters, which can be divided into ease of consultation of a website (i.e. usability) and trustworthiness of its content (i.e. reliability).

The five parameters that were used to evaluate usability are:

- i. Usefulness of content according to the information the user is looking for
- ii. User-friendliness, i.e. a well-organised website enables users to navigate easily within it, but also has images and/or videos associated with textual content
- iii. Quality of content (texts without errors, high quality pictures and other media)
- iv. User loyalty encouraged by intra-site services such as newsletters, membership and/or links to social media
- v. Aesthetic appeal (it can be partly subjective, but a website should make the content appealing so as not to invalidate the usability).

² 'It is a form of artificial intelligence that can currently produce high-quality text, images, videos, audio, and synthetic data in seconds', and since 2014 it 'evolved to the point of being able to create images, videos, and audio that seem authentic recordings of real people' (Foote 2025), which are produced at the user's request. While AI and generative AI are not a recent invention, the widespread use of the latter dates, however, to late 2022: e.g., OpenAI launched ChatGPT in November 2022.

Furthermore, for digital content to be not only easily accessible to the users, but also reliable, we believe that the following parameters must be met:

- i. Clarity of purpose for which the site was created
- ii. Trust in the manager of the website (must clearly state who the owner(s) and/or content creators are)
- iii. Source availability for non-original material which may be present
- iv. Author's authority in relation to original content, especially if it is of scientific/academic matter
- v. Topicality of the information provided on the site (must be reviewed and checked constantly).

The second type of criteria presented above, known as reliability, is the most important in relation to the transparency and accuracy of content, particularly scientific content derived from, in our case, underwater archaeological research and studies. To achieve an excellent score for this parameter and therefore be considered highly trustworthy, a website must meet all of the above requirements.

These ten simple parameters can be applied by any user to determine which content on the web, not just regarding underwater archaeology, can be trusted and be a useful tool for education on the matter, and which ones are a lair of superficial and/or false information.

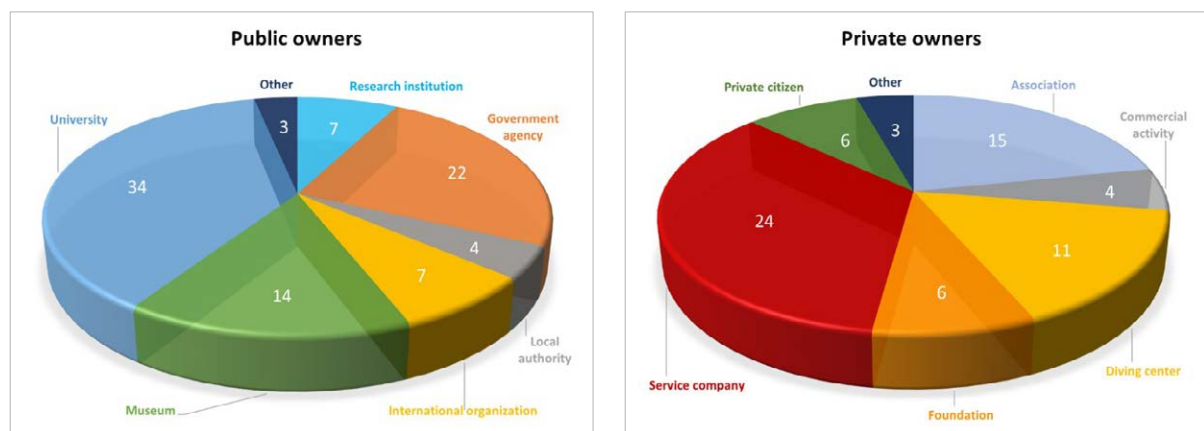


Figure 1. Graphical distribution of the ownership categories of the 160 websites explored and scrutinised, divided into public (= 91) or private (= 69) owners.

Discussion

The 160 webpages gathered and analysed consist of 51 Italian-owned sites, 46 European, 61 non-European and 2 of unclear origin, for a total of 27 different countries detected: Australia, Bermuda, Bulgaria, Canada, Cyprus, Croatia, Denmark, Egypt, Philippines, France, Germany, Greece, Ireland, Israel, Italy, Malta, Mexico, Netherlands, Portugal, South Korea, Spain, Sweden, Switzerland, Turkey, Ukraine, UK and USA.³

³ Excluding Italy, the countries to which most of the websites belong are the US (41), the UK (17) and Australia (8).

The websites examined can be grouped into seven categories, related to the topic of the content and the ownership: institutional, whose content is curated by government agencies, universities, research institutions or private ones, such as foundations, associations and non-profit organizations that present, for the most part, their research/work projects; they sometimes can be monothematic, meaning that they are dedicated to a single topic related to underwater archaeology, e.g. a specific study. The other types include divulgation websites, like encyclopaedias pages, blogs or other sites curated by professionals presenting their surveys. Informative sites, i.e. newspapers or privately owned, that (re)publish news and the latest discoveries. Educational ones created to teach the users about UCH through videos, booklets and games. But also, within the sample we find promotional sites, owned by companies with work expertise in underwater archaeology, and commercial pages curated by businesses that sell something, such as diving centers that offer guided tours of an underwater archaeological park or a submerged site.

The sites related to our subject of study are therefore numerous and diverse, ranging from those with completely unreliable and superficial content to those with trustworthy and useful information. By sorting through all the sites to discern the most consistent ones, based on the criteria listed above, and with the most compelling digital resources, we can break them down into two main groups: the first comprises those webpages that are useful for a wide audience wishing to learn about submerged cultural heritage, while the second collection of URLs is more geared towards professionals. The intention of presenting a small selection of the websites examined is to provide an overview of reliable content that is available on the web that may be useful.

1) *Virtual tourism, divulgation and educational purposes on UCH for the general public:*

- a. Interactive and immersive media, such as 3D models, virtual tours, 360° videos or content designed to be enjoyed also through VR (Virtual Reality) or AR (Augmented Reality), into websites dedicated to the underwater cultural heritage of a region or a country: we can cite *MUSAS - Musei di Archeologia Subacquea*⁴, with text sheets, videos, 3D models of the finds and digital reconstructions of different submerged sites located in four ancient cities (Baiae, Kaulonia, Croton and Egnatia) along the coast of the South of Italy, which also offers an app where the users can virtually explore these places; *The Virtual Museum - Underwater Malta*⁵ in which the users can interact with 3D models of several deep-sea wrecks; *The online Museum of Underwater Archaeology*⁶ is a portal created by the University of Rhode Island that collects articles, some GIS story maps on specific themes, virtual exhibitions, digital collections of finds and educational resources on underwater archaeology; *Museums in the Sea* is the virtual tour of Florida's submerged archaeological preserves, collecting 12 wrecks for visitors to check out; some companies that work in the underwater archaeology field are also committed to

⁴ <<https://www.progettomusas.eu/>>, viewed 16 January 2026.

⁵ <<https://underwatermalta.org/>>, viewed 16 January 2026.

⁶ <<https://mua.apps.uri.edu/MUA.htm>>, viewed 16 January 2026.

communicating UCH and their projects to the public through virtual exhibitions, such as the *Pascoe Archaeology* one⁷, who created 'Educational Web Tours' - as they described on its site - on two UK shipwrecks. Moreover, since April 2022, the date in which the survey on the Internet for this study was concluded, other virtual museums have been made public, like for example Poland's *Virtual Open-Air Museum of Wrecks in the Gulf of Gdańsk*⁸ or Croatia's *The Gagliana Grossa Virtual Museum*⁹ - also known as Gnalic shipwreck (Bosch *et al.* 2017).

Virtual tours, 3D models and other interactive media are also offered on some physical museums' webpages, such as the HM Endeavour's wreck section inside the *Australian National Maritime Museum*¹⁰, or the *Vrak - Museum of Wrecks*¹¹ that provides interactive map and timeline for Sweden still submerged or recovered UCH that the users can go through. It should be said that on the UNESCO website is available a page created in 2020 and updated in 2023 with a list of virtual museums all over the world.¹²

- b. Some websites have also the possibility for young audiences to learn about UCH through online playing, such as the 'Wreck seeker' video game or the virtual tours of shipwrecks made specifically for kids created by the aforementioned *Australian National Maritime Museum*. One webpage is completely dedicated to promote a downloadable video game, *Dive in the Past*¹³, developed to appeal to a young audience, but not limited to them, in which the user can explore four underwater archaeological sites across Europe (Cozza *et al.* 2021). On USA's *National Oceanic and Atmospheric Administration* website there are available two pages about submerged cultural heritage with videos and games for children.¹⁴ Kids can learn about UCH in a playful way even through digital booklets and worksheets, free-to-access on, for example, the *Maritime Archaeology Trust* website¹⁵.
- c. Databases, GIS and archives, made accessible mostly by government agencies and research institutions: e.g., the Ministry of Culture of France has a website dedicated to the dissemination and education of French UCH to the public, with an interactive map¹⁶; Ireland's *National Monument*

⁷ <<https://pascoe-archaeology.com/divertrail/>>, viewed 16 January 2026.

⁸ <<https://wsw.nmm.pl/en/>>, viewed 16 January 2026.

⁹ <<https://gnalic.arsnautica.org/>>, viewed 16 January 2026.

¹⁰ <<https://www.sea.museum/en/maritime-archaeology>>, viewed 16 January 2026.

¹¹ <<https://www.vrak.se/en/wrecks-and-remains/#/map>>, viewed 16 January 2026.

¹² <<https://www.unesco.org/en/articles/virtual-museums-underwater-cultural-heritage-respond-covid-19-crisis>>, viewed 16 January 2026.

¹³ <<https://medrydive.eu/dive-in-the-past/>>, viewed 16 January 2026.

¹⁴ <<https://oceantoday.noaa.gov/every-full-moon/welcome.html>>, viewed 16 January 2026.

¹⁵ <<https://maritimearchaeologytrust.org/education-outreach/learning-in-your-space>>, viewed 16 January 2026.

¹⁶ <<https://archeologie.culture.gouv.fr/archeo-sous-marine/en>>, viewed 16 January 2026.

Services makes available a data bank of its wrecks¹⁷; the Australian government website offers GIS and databases of UCH divided by typology of finds of its waters¹⁸; recently the Puglia region (Italy) has uploaded online a web GIS of local archaeological submerged sites¹⁹, developed by several universities (Spreafico *et al.* 2024). The *UnderwaterMuseMap*²⁰ (Figure 2) is also a webGIS created by a university and based on the ‘UnderwaterMuse’ international and inter-university research project (Auriemma and Del Bianco (eds) 2024), which makes available for public access the coastal and underwater sites and museums linked to UCH in the territories of the Italian and Croatian partners. Lastly, even non-profit organizations can have accessible data banks and interactive maps on their websites depicting the object of their field research, such as the *Honor Frost Foundation*.²¹

2) *Scientific dissemination and digital tools for researchers in the field of underwater, maritime and naval archaeology*²²:

- a. Data banks, archives and digital libraries, such as the *Oxford Roman Economy Project Shipwrecks Database*, built mostly around A.J. Parker’s work (1992) but updated to 2009, freely downloadable as an Excel file, that ‘aims to catalogue all known ancient wrecks in the Mediterranean up to AD 1500 to provide a basis for quantitative analysis over time’²³; similar is *NAVISone*, an online searchable database of the remains - but also of the iconography - of ships from Europe from the earliest finds through AD 1200.²⁴

Even though Italy doesn’t have a collective digital catalogue dedicated exclusively to UCH, two important GIS portals managed by national institutions that includes underwater sites are the *Geoportale Nazionale per l’Archeologia*²⁵ (accessible since July 2023; Calandra *et al.* 2021) and *Ricerca*

¹⁷ <<https://www.archaeology.ie/advice-and-support/locate-a-monument-or-wreck/wreck-viewer/>>, viewed 16 January 2026.

¹⁸ <<https://www.dcceew.gov.au/parks-heritage/heritage/underwater-heritage/auchd>>, viewed 16 January 2026.

¹⁹ <<https://andarpermarepuglia.it/>>, viewed 16 January 2026.

²⁰ <<https://open.unive.it/underwatermusemap/>>, viewed 16 January 2026.

²¹ <<https://honorfrostfoundation.org/archives/>>, viewed 16 January 2026.

²² Underwater archaeology is a generic term that describes only the context in which archaeological investigations are carried out. Therefore, it is intertwined with maritime and naval archaeology only when the object of study in these fields (e.g. ports, coastal infrastructures, shipwrecks, etc.) is submerged (Capulli 2021: 18, Fig. 2).

²³ <<https://oxrep.web.ox.ac.uk/shipwrecks-database>>, viewed 16 January 2026.

²⁴ <<https://www2.leiza.de/navis/>>, viewed 16 January 2026.

²⁵ <<https://gna.cultura.gov.it/>>, viewed 16 January 2026.

*Archivi e Pratiche per la Tutela Operativa Regionale*²⁶ (Frassine *et al.* 2023): they are data repositories from archaeological research, excavations or fortuitous finds, either regional (RAPTOR) or national (GNA), which have recently been digitalized and are now being implemented directly with the latest archaeological work by the professionals themselves. In particular, the second portal has a section that is open to all users, i.e. the position of archaeological sites on the map and their brief descriptions in the form of summary sheets, while another section is accessible only to professionals that can view the full content (precise coordinates, excavation reports, list of materials, etc.) and upload their data. Finally, we can cite as an important tool for researchers *The Nautical Archaeology Digital Library* (NADL)²⁷, created by the Nautical Archaeology Program of the Texas A&M University, which includes different types of resources, from glossaries and bibliographies to databases and ship reconstructions (Monroy *et al.* 2011). In addition, of course, the databases mentioned above as useful tools for dissemination to the general public can also be consulted and used for research purposes by scholars.

- b. Open-access books, journals and reports: they are more ‘traditional’ forms of media, which are made accessible on the web and contribute to the faster and further dissemination of scientific research and knowledge. If we consider those that deal with the subject in its entirety, thus excluding the numerous other articles that deal with underwater archaeology published in journals dedicated to other areas of research, examples are the Italian *L’archeologo subacqueo*²⁸, the French *Archaeonautica*²⁹, the Nautical Archaeology Society’s publication, *The International Journal of Nautical Archaeology* (IJNA)³⁰ (accessible by subscription and membership to the website), the magazine of the Institute of Nautical Archaeology magazine, *INA Quarterly*³¹, and of their sister organization Turkish Underwater Archaeology Foundation, *TINA Maritime Archaeology Periodical*.³²

Conclusion

Digital content is mostly used to make the fruition of the submerged heritage more accessible, but also to spread news of the most recent excavations or studies. For this reason, virtual tours, 3D reconstructions and other multimedia content are now integrated and they complement more ‘traditional’ sites that offer informative and educational data (e.g. institutional websites and museum

²⁶ <<https://raptor.cultura.gov.it/mappa.php>>, viewed 16 January 2026.

²⁷ <<https://shiplib.org/>>, viewed 16 January 2026.

²⁸ <<https://edipuglia.it/aso/>>, viewed 16 January 2026.

²⁹ <<https://journals.openedition.org/archaeonautica/>>, viewed 16 January 2026.

³⁰ <<https://www.nauticalarchaeologysociety.org/ijna>>, viewed 16 January 2026.

³¹ <<https://nauticalarch.org/ina-quarterly-archive/>>, viewed 16 January 2026.

³² <<https://www.tinaturk.org/dergi/e-index.html>>, viewed 16 January 2026.

portals), which in the past featured almost exclusively non-interactive content, and although more reliable, were considered less engaging by users. Even though it's clear that these resources are important means of divulgation, they are not always reliable sources from which to draw information, given that quite often they are not written or verified by professionals.

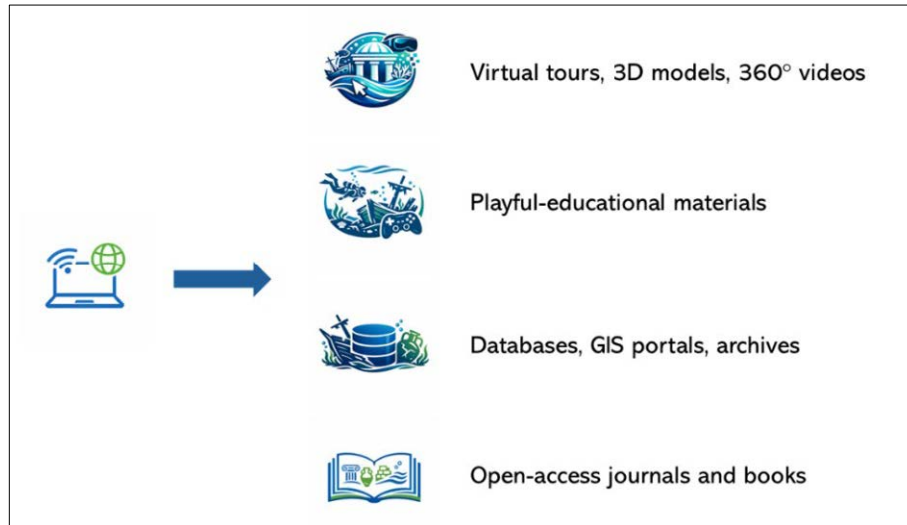


Figure 3. Refiguration of different types of digital resources that can be found on the web related to UCH.

Now the challenge of distinguishing between what can be trusted from what cannot is becoming even more difficult. Whereas previously texts, images and videos that had been altered or created from scratch to achieve a certain result - for example to proclaim incredible new archaeological discoveries - were fairly recognisable and identifiable, today the web is being flooded with artificially generated content³³ that has little to no scientific value. This must be added to the fact that the general public does not always have the tools to detect the falseness of information visualised and some of them are easily deceived by the spectacular nature or the realism of these powerful tools. Therefore, despite the AI's potential as a tool for scientific research and knowledge dissemination that can be exploited by professionals and scholars (Tenzer *et al.* 2024) - and particularly for underwater archaeology for the reason stated in the introduction (Demilio and Castro 2025) - it is becoming a vector for misinterpretation and distorted representations in the field of archaeology in general (Hood 2025). In fact, generative AI is increasingly being used by non-professionals to create reconstructions that are highly imaginative, to say the least, which could be described as 'pseudo-archaeology' (or fake archaeology). That is why it is now even more necessary to know how to recognise reliable digital sources and to what extent.

³³ For an example of an article written completely by AI about underwater archaeology, see: <<https://medium.com/@evolwe.ai/ai-in-underwater-archaeology-discovering-hidden-treasures-beneath-the-sea-1ac94d9cea59>>, viewed 15 January 2026.

So, although this study is based on pre-AI digital content and can therefore be considered somewhat outdated, the main criteria presented in this paper could, however, be useful and applied to these new artificial media. Namely, the web user should always verify the information visualised and be able to trace it: it must be made clear that the image, video or text that claims to have a scientific value has been produced by artificial intelligence and, if so, which scientific sources were used for the artificial reconstruction and/or whether anyone has verified the results.

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All About Access: Overcoming Physical Barriers to Visiting Underwater Cultural Heritage Sites in Malta

Rebecca Xerri¹

Abstract

Over the past two decades, the ‘out of sight, out of mind’ mentality associated with Malta’s underwater cultural heritage (UCH) has been challenged. It was evident that if UCH remained ‘invisible’ or limited to divers, the scope of UCH becoming a shared and widely valued heritage would be greatly limited. This paper describes Malta’s efforts in making UCH accessible to the population at large. An overview of the strides made in the fields of physical and virtual access to UCH sites off Malta and Gozo since the creation of Heritage Malta’s (HM) Underwater Cultural Heritage Unit (UCHU) in 2019 is provided.

The successes HM’s dive ticketing system, *Underwater Malta - The Virtual Museum and Dive into History 360 project* are discussed. Merging both physical and virtual access, the last HM project described is the upcoming launch of the first deepwater archaeological park in the world, in Xlendi (Gozo). Finally, the importance of accessibility and public outreach are discussed within the context of the author’s ongoing doctoral research on the management and communication of deepwater cultural heritage at the University of Malta.

Introduction

The Maltese Islands boast a wealth of underwater cultural heritage (UCH) sites, primarily located in deep waters. For a long time, these sites remained ‘out of sight’ and ‘out of mind’ to the population at large. Since the creation of Heritage Malta’s (HM) Underwater Cultural Heritage Unit (UCHU) in 2019 and Malta’s signing of the 2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage two years later, a drastic change in the way UCH is managed and communicated occurred. This paper provides an overview of the strides in UCH protection and outreach that have occurred since UCHU’s creation. The discussion culminates in the presentation of UCHU’s latest project - The Xlendi Underwater Archaeological Park - which represents a milestone in local heritage management as well within the global UCH scene. Finally, the concept of accessibility to UCH is discussed within the context of the author’s ongoing doctoral research at the University of Malta. This paper is based on the author’s (a current PhD student who is also affiliated with Heritage Malta) experiences in the local UCH field as well as interviews with UCHU staff and access to statistical information provided by UCHU.

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Heritage Malta's Underwater Cultural Heritage Unit

UCHU was created by Heritage Malta in 2019 with a mission to be proactive when it comes to UCH. In an interview with Professor Timmy Gambin, the Director of UCHU, it was explained that UCHU was created with three main goals in mind. Firstly, it was important to materialize the philosophy that all UCH sites should be made accessible. This aligns with UNESCO's 2001 Convention on the Protection of the Underwater Cultural Heritage, from here on referred to simply as the 2001 Convention, which highlights humanity's right to access *in situ* underwater cultural remains. Secondly, UCHU emerged out of a need to regulate and manage UCH. Up until 2018, access to the numerous wrecks located in Maltese waters was unregulated, leading to several instances of looting and damage to wreck sites. Divers were free to access any and all UCH sites without requiring authorization, thus placing this heritage under great threat.

The SS *Polynisien*, a French Risbec-class ocean liner wrecked in Maltese waters, is in fact commonly known as 'the plate wreck', as the 68 metres deep site is known to have had several plates stolen from it in the past. Lastly, UCHU aims at making UCH 'future proof', as Professor Gambin describes. This considers the fact that technology is developing at such a remarkable pace and making such huge strides, that accessing previously unimaginable depths is now much easier. UCHU is composed of a multi-disciplinary team of archaeologists, divers, and members of diverse disciplinary backgrounds.

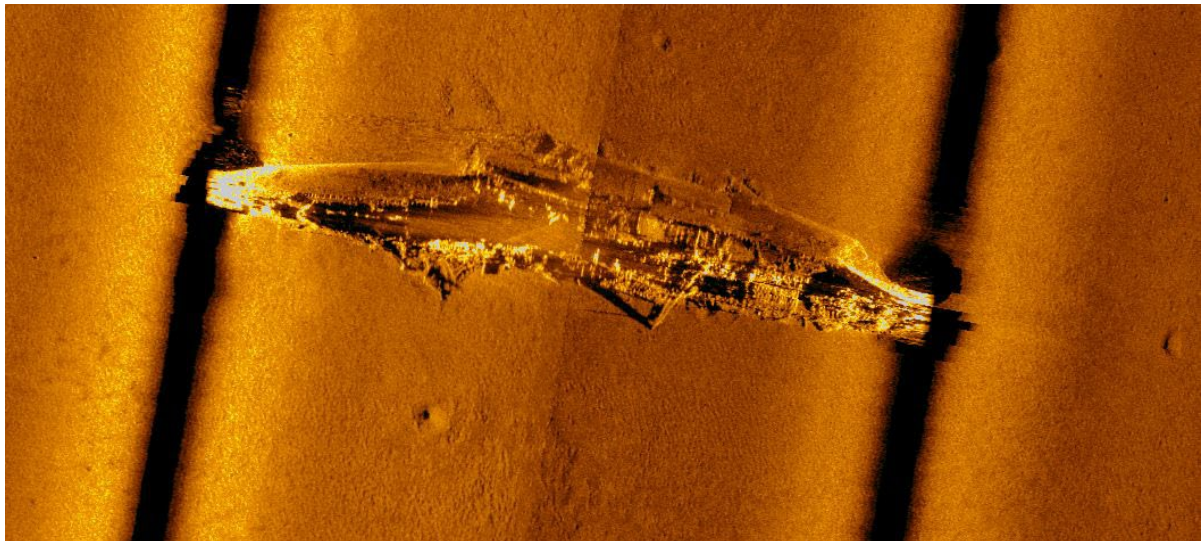


Figure 1. Side Scan Sonar image of the SS Polynisien Wreck (After *The Virtual Museum - Underwater Malta*, 2023).

Physical Access for the Diver: The Dive Ticketing System

In the spirit of access to *in situ* UCH, UCHU developed a ticketing system whereby divers can buy a ticket and in a legal and regulated manner visit the UCH site of their choice. The express aim of this was to ensure that access to UCH can be brought to the same level as that concerning terrestrial sites (Sausmekat 2023). This system allowed UCHU to fulfil its duty to protect and preserve UCH whilst

maintaining its goals as a signatory to the 2001 Convention to ensure public access to this heritage. The booking system is described on the Heritage Malta website, which presents those underwater sites that are open to the public. Currently, 18 dives are available and presented on the website, accompanied by a textual description and images/videos of the site in question. All these sites are considered deepwater sites, since they lie at water depths below 50 metres, and the cost of a ticket ranges between €8 and €40.

Once the diver decides upon a site, they are to contact one of the registered dive schools listed on the website, which will go ahead and book their ticket along with a registered dive boat to use for the excursion.² These dive schools pay an annual fee which provides them with access to the booking system, thus leaving the organization of the dive in their hands. This system is thus highly dependent on stakeholder collaboration and for this to work, UCHU has invested time and effort in establishing a good relationship with diving schools and the diving community at large. This relationship is the foundation upon which initiatives such as these can work, ensuring both the integrity and enjoyability of the UCH concerned. Once everything is booked, an automated email is sent out to all stakeholders.³

The most visited site is the aforementioned SS Polynesian wreck (Figure 1), which has seen 798 divers since its launch as a regulated heritage site. Overall, the system has seen over 2300 tickets booked. Considering that it was launched just a few months before COVID-19 hit, which heavily impacted any sort of travel and in-person visits to heritage sites, UCHU is content with the results of this initiative so far. The majority of divers are Maltese locals, indicating considerable interest amongst the local diving community. Many divers from the UK, France and other areas have also visited the UCH sites on offer, proving that these attract both a resident and tourist audience. Of noteworthy mention with regards to the issue of access vis-à-vis preservation, is that all the sites available for booking are deepwater sites.

The fact that these sites require technical expertise to access has meant that less people are likely to visit and possibly interfere with the site. The preservation conditions that are associated with deepwater environments in comparison to shallower sites also aid the integrity of the UCH in question. Yet, whilst the physical location of Malta's UCH has helped in its safeguarding, it has also added to the 'out of sight, out of mind' illusion that creates a lack of awareness amongst those that have never come into contact with this heritage (Gambin *et al.* 2021: 3). This reality meant that UCHU had to break the physical barrier presented by UCH and reach the wider population in an effective manner.

² In this instance, 'registered' refers to dive boats and dive centres that are registered with Heritage Malta.

³ The stakeholders concerned are the Vessel Traffic Service (VTS), the Armed Forces of Malta (AFM), the Fisheries Department and most importantly the Hyperbaric Chambers of Malta and Gozo. Therefore, in cases of emergency, all relevant stakeholders are already informed of the number of divers and the depths, facilitating a faster emergency response.

Physical Access for the General Public: Museum Exhibitions

Over the past few years, two temporary exhibitions with a maritime focus have been held at the National Museum of Archaeology. The first, which was formerly set up at the Cittadella in Gozo and the Malta National Aquarium, focused on the famous Phoenician Shipwreck off Gozo and the excavations that took place at the site. The exhibition brought to light a deepwater wonder that the general public did not have any form of access to before. The second exhibition was organised in connection with the Honor Frost Under the Mediterranean II conference, hosted in Malta in November 2022. The exhibition focused on the work of Honor Forst on the Mortar Wreck, located in Mellieha Bay in the North of Malta. The exhibition highlighted the contributions of this pioneer in underwater archaeology to the local context. Visitors to the exhibitions were thus not only introduced to material heritage, but also to the underwater archaeological profession. Of noteworthy mention is that these exhibitions were offered to the public free of charge.

Traditional museum displays are an important means of outreach and communication. The exhibitions in question have attracted both a foreign and local audience with an interest in underwater archaeology. In view of the fact that i) the Malta Maritime Museum has been undergoing restoration for the past few years and has been closed to the public, and ii) museum-based maritime archaeology is limited to a small section in the Gozo Museum of Archaeology, temporary exhibitions provide an excellent solution for bringing UCH to the surface. Being hosted in areas which are already of interest - the Cittadella, National Aquarium and the National Museum of Archaeology - these exhibitions have provided museum goers with the opportunity to learn about a world of archaeology that they might not have had prior knowledge of or been interested in before. This very activity contributes to creating awareness and raising the status of underwater archaeology to the same level as terrestrial cultural heritage. This reasoning also works vice versa, as people who visited the venues with the prime interest of touring the exhibition would have also been provided with the opportunity to explore other parts of the museum/heritage site, thus enhancing an all-round awareness of cultural heritage.

Virtual Access for the General Public: The Virtual Museum

Whilst temporary exhibitions have allowed Heritage Malta to bring UCH to the people, strides in the sector of virtual access have created the possibility for people to be brought to the UCH site. In light of UNESCO's insistence on 'non-intrusive access' to UCH (Art. 2.10 of the 2001 Convention) and in recognition of the fact that the majority of the world's population will never be able to physically access underwater archaeology, a solution in the virtual realm was sought (Gambin *et al.* 2021: 2). Virtual access was viewed as an ideal way to ensure a balance between the continued protection of UCH whilst raising awareness and appreciation for this rich heritage (Gambin *et al.* 2021: 2). This led to the creation of *Underwater Malta - The Virtual Museum*, which was launched in 2020.

At the time of writing, the virtual museum showcases 20 wrecks in Maltese waters, ranging from ancient wrecks, such as the Phoenician Shipwreck in Xlendi, to remains from World War II, such as the JU88 aircraft wreck. The museum provides access to textual information about the site in question, describing its location, main features and history of research. A 360° 3D model of the site along with a video is also available. For those who have access to a Virtual Reality (VR) headset, a VR experience is also offered, allowing the individual to immerse themselves in a ‘dry dive’ of the site from the comfort of their own home.

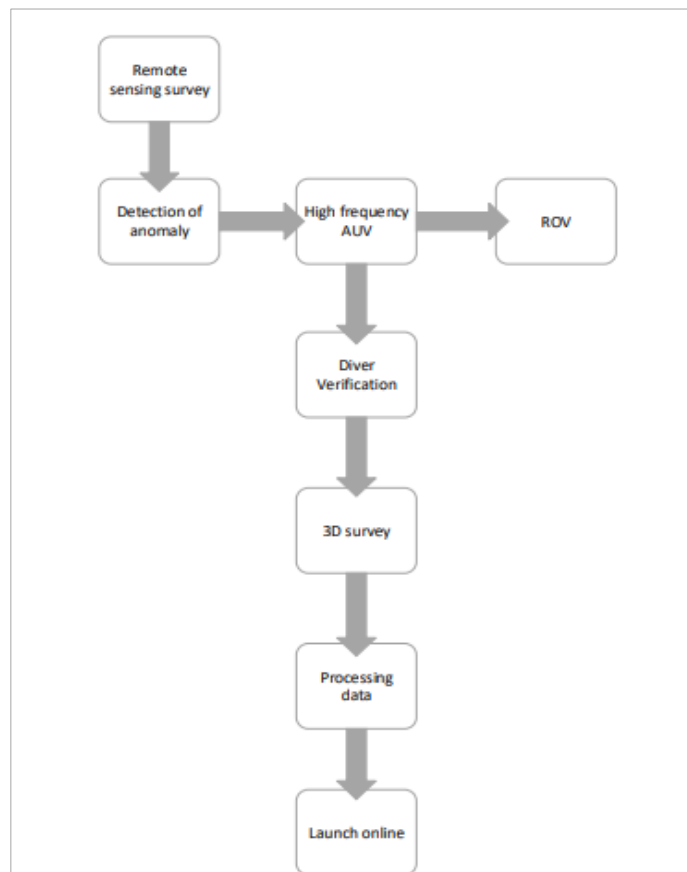


Figure 2. Workflow adopted by Heritage Malta for the creation of Underwater Malta (After Gambin *et al.* 2021: 4).

In order for such experiences to be created, a dense amount of data capture was required. Figure 2 outlines the workflow adopted for the creation of Underwater Malta. This schematic is in line with UNESCO’s advocacy for *in situ* preservation, since it uses non-destructive geophysical and non-intrusive diver surveys to gather data. The project involved the use of Multibeam Sonar and Side Scan Sonar mounted on an Autonomous Underwater Vehicle (AUV) to detect anomalies and survey areas of interest (Gambin *et al.* 2021: 5). A Remote Operated Vehicle (ROV) was also employed to gather data and assess if the site in question was suitable for diver verification and 3D photogrammetric survey (Gambin *et al.* 2021: 6). This data was then processed and converted into 3D models which serve as both a management and communication tool for the underwater archaeologist. From a scientific perspective, these 3D models provide baseline data on the condition and state of preservation of the wreck site at the time of

recording. Any future documentation may then be compared to this data. From a communication perspective, these 3D models allow the public to explore sites that would otherwise remain ‘out of sight’ and ‘out of mind’.

Of noteworthy recognition is that Underwater Malta was launched in June 2020, during the peak of the COVID-19 pandemic. This is extremely relevant, as more than ever before, the advantages of technology and the online world were made extremely clear. During this time, the internet became the new workplace, supermarket and platform for catching up with friends and family. Having a good internet connection has become integral to everyday life. Having gone through the pandemic and the harsh realities that came with it, the museum sector realized the importance of a digital presence. Several museums took to their websites, Instagram and Facebook pages to keep the experience alive and offer new opportunities for visitation. In a globalised world where ease of access is top priority, virtual museums are becoming not only common but crucial to the development and success of the museum institution. They allow both local and foreign audiences worldwide to encounter what is essentially a ‘common heritage’ (UNESCO 2001: 1).

Virtual Access for the General Public: Dive into History 360

Aside from the Underwater Malta project, UCHU has also been reaching audiences of all ages through virtual tours. The Dive into History 360 program provides participants with the opportunity to tour an underwater archaeological site without having to get into the water. The virtual tour is disseminated via virtual reality headsets worn by the participants. At the time of writing, all the sites available on the Underwater Malta virtual museum are available to tour in 360°. Via the Dive into History 360 program, all the participants are required to do is select which site they wish to tour, wear the headset and explore the underwater world. The tour is premeditated - it has a predetermined path which the audience follows. The audience cannot deviate from this path or slow down the dive, but they are able to look up and down, in front and behind, as well as to the sides in order to experience different parts of the site. No other movement is required. Although audience participation is limited in this tour, based on feedback it has been proven to emulate the feeling of being part of a dive. The virtual reality system used is also easy to set up and straight-forward for the audience to use. It thus allows one to reach large groups of people in an efficient manner.

The Dive into History 360 program has proven to be successful in engaging people of all ages and from different professions. The program is one that travels, and as such it does not have a permanent home.⁴ UCHU thus focuses on being present at events or creating workshops to disseminate this experience. Much of the focus of this program has been on school visits. During these visits, school children are given a presentation about UCH followed by the virtual tour. The reactions have been positive, and the

⁴ In an interview with Ms Maja Sausmekat, Principal Officer at UCHU, it was however imparted that UCHU aim to have all sites available in 360 via YouTube in the near future.

experience is evidently enjoyable amongst this audience. Dive into History 360 has also reached elders at care homes, the deaf association, local scouts' groups, groups of heritage professionals and the general public that attend cultural events locally and abroad. UCHU have been present during popular local events such as Notte Bianca in October 2022 and Science at the Citadel in May 2023 (Figure 3), and abroad at conventions such as BOOT Dusseldorf in January 2023 and the Europe Day celebrations in Brussels in May 2023. The Dive into History 360 experience was also available for attendees of the Rebreather 4 Forum, hosted in Malta in April 2023. With each different category of audiences, the feedback has been consistently positive, proving that virtual tours are an effective outreach strategy for communicating a heritage that is otherwise inaccessible to most.



Figure 3. Dive into History activity at the Science in the Citadel Event at the Cittadella in Gozo (After Malta Underwater Cultural Heritage Unit, 2023).

The strength of the Dive into History 360 program does not lie solely in creating innovative experiences of UCH visits. It lies primarily in creating awareness. By allowing the general public, especially younger generations, to access UCH, a wider awareness and appreciation of this heritage can be sought. Awareness is thus the first step towards educating the public about their duty to protect their common heritage. Once members of a community become aware of the value of something, they are more inclined to protect it. The Dive into History 360 program is thus an educational endeavour that contributes towards the bigger picture of heritage management and communication.

A New Project: The Xlendi Underwater Archaeological Park

UCHU's latest major project has focused on a unique shipwreck off of Xlendi, Gozo. Xlendi is a modern-day fishing village and popular tourist destination, and reference to the village is not new to the world of maritime archaeology. Indeed, the area has become famously known for University of Malta's work on the Phoenician Shipwreck. Excavation of this eighth-century BC vessel, spearheaded by Professor Timmy Gambin, saw major attention due to the depth of the site. Indeed, at 110m, the site became the venue for the first ever archaeological excavation by divers beyond 100m. Yet, this site is not the only gem to be found in Xlendi's waters. Since the 1960s, a considerable number of amphorae have been discovered from waters near Xlendi's coastal defense tower (Azzopardi 2013: 287). This was followed by several expeditions to retrieve artefacts from the area in the 1970s under the direction of one Professor John Woods at the Imperial College of London, with objects being recovered from water depths of as deep as 60 metres (Azzopardi 2013: 288). In 1993, a deepwater survey of the area was carried out, followed by another in 2006 (Azzopardi 2013: 288). It became certain that at least one shipwreck was present at a depth of 105m. This deepwater site came to be known as the Tower Wreck (Figure 4).

The Tower Wreck gains its name due to its proximity to the Xlendi coastal watchtower built in 1650 under the direction of Grand Master of the Order of St John Giovanni Paolo Lascaris. The site covers an impressive area of 67,000 square metres, comprised of scatters and clusters of ceramic artefacts that exist largely intact and in a good state of preservation. These objects include multiple amphora types as well as bowls and urns, amongst other ceramics dateable to the Punic period (3rd-4th century BC). The causes leading to this shipwreck are yet unknown, although it has been posited that a major natural event such as a tsunami might provide explanation for the large amount of cargo discovered in this area. It seems likely that the Tower Wreck contains at least one shipwreck.

The cultural landscape which the Tower Wreck forms part of, considering its proximity and links to the ancient harbour of Xlendi, transforms the wreck into something more than a site. Its cultural richness, combined with its natural and marine life, has merited the elevation of the Tower Wreck from site to park. In 2021, UCHU embarked on a major project - that of making the Tower Wreck the first publicly accessible deepwater archaeological park in the world. Since then, UCHU has undertaken the systematic recording of the Tower Wreck, which is to be preserved *in situ*. Non-invasive surveying techniques are being employed and excavation or retrieval of artefacts from this wreck are not currently intended. This project is, at the time of writing, fast approaching its launch date. The process of creation, management and communication of this park forms the case study of the author's doctoral research focused on creating a framework for the management and communication of deepwater cultural heritage (DCH). The project provides an excellent case study for the assessment of the best techniques to ensure the sustainable management of deepwater cultural heritage as well as the effective communication of this heritage to the public.

Once launched, the park will be both physically and virtually accessible. Technical divers certified to dive to a depth of 105m will be able to book a ticket through the ticketing system described above and physically dive a portion of the site. The general public will also have access to a permanent exhibition

set up at the newly restored Xlendi Tower. This tower is under the care of the Munxar Local Council, who UCHU has collaborated with to create this exhibition. The exhibit is comprised of information panels and three partially whole objects which had been retrieved from the Tower Wreck in earlier years. At the time of writing, the tower is a few weeks away from being opened to the public. This part of the project, which is essentially a collaborative venture with the Munxar Local Council, is a perfect example of how UCHU goes about managing local UCH. Stakeholder cooperation is extremely important, and their support is highly valued. Without having worked to establish a good relationship with stakeholder groups ranging from local divers and dive clubs to fishermen and local councilors, the projected success of a project as large as the Xlendi Underwater Archaeological Park would be skeptical at the very least.

Aside from diving and visiting the exhibition at the Xlendi Tower, the general public will be able to visit the park virtually at the Underwater Malta: The Virtual Museum. The Tower Wreck is in the process of being added to this platform, which will give visitors access to a 3D model, video, photos as well as textual information about the park. Eventually, it is intended that the Xlendi Underwater Archaeological Park will have its own website with this virtual museum access included. Also, in the realm of virtual access, the Tower Wreck has also been incorporated into the Dive into History 360 program. Attendees to the recent Rebreather 4 Forum, hosted in Malta in April 2023, have had early access to this experience, which takes the audience on a 'dry dive tour' of the park. Based on the success already observed with other sites in the Dive into History 360 program, it is presumed that this experience will help bring the general public closer to this deepwater park.



Figure 4. Image showing part of The Tower Wreck (The Xlendi Underwater Archaeological Park)
(After Gration 2021).

Accessibility: The Way Forward

All the projects described above have a theme in common - accessibility. The duty of heritage professionals to provide means of non-intrusive, *in situ* access to UCH to the general public is enshrined in UNESCO's 2001 Convention and forms the heart of UCHU's endeavours. Since signing this convention in 2021, UCHU has paid further attention to *in situ* preservation. Besides being a cost-effective strategy that fulfils the duty to protect cultural heritage for future generations (Manders 2008) by enjoying this heritage *in situ*, individuals have the opportunity to become active participants in the heritage process (Scott-Ireton and McKinnon 2015: 160). With this first step being taken, one may then look at the bigger picture, which sees the wider appreciation and safeguarding of UCH.

Of course, with access comes the risk of disturbance. It is an undisputable fact that the more divers frequent a heritage site, the more the impact of human presence on the artefacts and marine life is felt. Yet, it is the author's belief that one must look at this issue with a wide lens. There is no stopping divers from accessing UCH, even illegally, as has been observed in Malta for several years before the creation of UCHU. By providing an option for authorized access, divers can still fulfil their adventurous desires whilst remaining within the bounds of the law and respecting the UCH. Tied to this, education is also key. From fundamental concepts of duty to protect UCH to simple instructions such as 'look but don't touch', the education system that backs any sort of access to UCH must be paid attention to. By providing access that goes beyond physical, UCHU has been successful in targeting their educational endeavours at the general public as a whole. The Dive into History 360 program and Underwater Malta: The Virtual Museum not only provide non-intrusive access to UCH but contribute towards the educational mission that has the safeguarding and enjoyment of UCH at its core.

The concept of access to the perceived inaccessible world that is UCH is tackled in the author's ongoing doctoral research at the University of Malta. This research aims at creating a framework for the management and communication of deepwater cultural heritage. Since all of HM's dive sites are considered as deepwater sites, Malta provides an ideal setting for this research to ensue. Furthermore, the case study of this PhD thesis is the Xlendi Underwater Archaeological Park, and thus the research benefits from first-hand knowledge of and experience with creating the world's first publicly accessible deepwater archaeological park. Within the proposed framework, the importance of community-based management strategies is enshrined. It is certain that without the support of a community, efforts at transforming the 'out of sight' into something 'within reach' would be in vain.

The successes of community collaboration and movements towards more bottom-up management systems are highlighted by projects such as those undertaken by the Florida Public Archaeology Network (FPAN). FPAN's Submerged Sites Education and Archaeological Stewardship (SSEAS) program, which trains divers in protecting and preserving UCH (Scott-Ireton and Moates 2019:165) and its Preserves Program, which allows public involvement in the safeguarding of UCH (Scott-Ireton 2006: 7) are examples of successful community-based management strategies. Involvement of the community at this level transforms the individual in society from a consumer to a producer (Jameson 2014: 6). These

concepts and strategies for community collaboration are integrated into the management framework proposed in the author's doctoral thesis.

Linked to a successful management regime is of course an effective communication program. As has been described, UCHU's various outreach programs use different methods to reach different audiences. A sound understanding of communication techniques is crucial to creating enjoyable and educational programs and products that raise awareness about the richness and beauty of UCH, as well as the collective duty to safeguard this heritage.

The doctoral research in question aims to investigate different communication strategies, departing from a perspective that derives from New Museology. This ideology focuses on the role of the museum institution as an educator (Stam 2005: 65). It looks to innovative modes of communication such as new technologies and digital media to perform this role (Stam 2005: 70). Within this perspective, the doctoral research focuses on outreach that is concerned with the personal experience of the visitor (Stam 2005: 66-70). It aims to transform the visitor from merely a passive viewer to an active participant in the heritage process. From the results observed thus far, it is believed that interactive experiences such as Heritage Malta's Dive into History 360 tours contribute towards this mission. It is clear that effective methods of communication are integral to fulfilling the goals of public education, which forms the backbone of any public heritage endeavour.

Conclusion

This paper has detailed the author's contribution at the *24th Symposium on Mediterranean Archaeology: Ideas that traveled by the sea* (Udine, February 2023). It has presented UCHU's endeavours in bringing UCH within reach of the general public, highlighting the two realms of access to this heritage. The concept of accessibility forms the backbone of this paper as well as UCHU's mission. It is hoped that future projects will expand the range of opportunities for breaking the barriers presented by UCH and make the previously 'invisible' no more.

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The 24th Symposium on Mediterranean Archaeology (SOMA 2023), held in Udine from 2 to 4 February 2023, offered an important occasion for the international community engaged in the study of the ancient Mediterranean. The theme 'ideas that travelled by the sea' provided a broad and stimulating framework for examining the movement of knowledge, technologies and cultural practices across the region.

Contributions explore navigation, ports and landing places, coastal landscapes and maritime connectivity, with particular attention to shipbuilding traditions and ancient trade routes. Underwater archaeological research features prominently, offering new perspectives on the dynamics of maritime interaction and on the mechanisms through which ideas, skills and materials circulated across the Mediterranean.

Organised by the Department of Humanities and Cultural Heritage of the University of Udine, in collaboration with the General Association for Mediterranean Archaeology and under the patronage of the Italian Institute of Underwater Archaeology, the Symposium brought together scholars from across the Mediterranean basin and Europe. The Proceedings gather the papers submitted after the event, presenting a representative overview of current research and illustrating the vitality and diversity of contemporary Mediterranean archaeology. SOMA 2023 emerges as a space where ideas circulated freely, continuing the long tradition of exchange that has shaped the Mediterranean world.

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